U. S. DEPARTMENT OF AGRICULTURE,

BUREAU OF SOILS—MILTON WHITNEY, Chief.

IN COOPERATION WITH THE WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY, A. E. BIRGE, DIRECTOR; COLLEGE OF AGRICULTURE, UNIVERSITY OF WISCONSIN, H. L. RUSSELL, DEAN; A. R. WHITSON, IN CHARGE SOIL SURVEY.

SOIL SURVEY OF ROCK COUNTY, WISCONSIN.

BY

W. J. GEIB, IN CHARGE, AND ARTHUR E. TAYLOR, OF THE U. S. DEPARTMENT OF AGRICULTURE, AND GUY CONREY AND W. M. GIBBS, OF THE WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY.

THOMAS D. RICE, INSPECTOR, NORTHERN DIVISION.

[Advance Sheets—Field Operations of the Bureau of Soils, 1917.]

WASHINGTON
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LETTER OF TRANSMITTAL.

U. S. Department of Agriculture,
Bureau of Soils,
Washington, D. C., November 1, 1919.

Sir: I have the honor to transmit herewith the manuscript report and map covering the survey of Rock County, Wisconsin, and to recommend that they be published as advance sheets of Field Operations of the Bureau of Soils, 1917, as authorized by law. This work was done in cooperation with the Wisconsin Geological and Natural History Survey and the University of Wisconsin College of Agriculture.

Respectfully,

Milton Whitney,
Chief of Bureau.

Hon. D. F. Houston,
Secretary of Agriculture.

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DESCRIPTION OF THE AREA.

Rock County lies in the extreme southern part of Wisconsin, about midway on the Wisconsin-Illinois boundary line. Janesville, the county seat, is about 32 miles from Madison. The county has an area of 716 square miles, or 458,240 acres.

Rock County comprises four topographic divisions, the Late Wisconsin drift region, the pre-Wisconsin drift region with a heavy covering of loess and drift, the pre-Wisconsin drift region with a light covering of drift, and the Rock River Valley Fill.

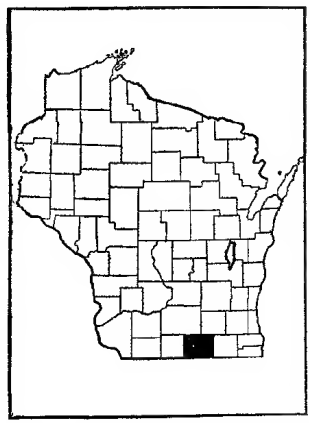

FIG. 1.—Sketch map showing location of the Rock County area, Wisconsin.

The Late Wisconsin drift region occupies the northern part of Rock County. Its terminal moraine enters from Dane County at the northwest corner of Union Township, extends in a southeasterly direction, and passes into Walworth County about 1½ miles northeast of Johnstown. The surface of this region ranges from undulating to rolling, but on the whole is gently rolling. In the southern part, near the terminal moraine, the surface is more or less broken by kettle basins, gravel knolls, and winding ridges and sloughs. As a whole the surface configuration is very much as the ice shaped it, the streams, with the exception of Rock River, not yet having had time to develop valleys or reach the many undrained marshes, lakes, kettle basins, and other depressions.

The pre-Wisconsin drift region in the southeastern quarter of the county has a covering of drift material ranging from 10 to 100 feet or more in thickness, overlying which is a blanket of loess ranging in thickness from 2½ to 10 feet. The surface is everywhere smooth, and varies from gently undulating to gently rolling. All parts of

this region are reached by drainage ways. West of Rock River and south of the Late Wisconsin terminal moraine the pre-Wisconsin drift is very shallow, the covering of morainic material being in some places lacking and reaching a maximum thickness of only 5 or 6 feet, except in a few very small areas, as east of Footville and northwest of Janesville, where it attains thicknesses ranging from 40 to more than 100 feet. The thinnest drift occurs in Magnolia, Spring Valley, and Avon Townships, where in many places a few scattered crystalline bowlders or gravel are the only evidence of glaciation. The loessial blanket, which is common throughout the Late Wisconsin drift and the pre-Wisconsin drift east of Rock River, in few places reaches 3 feet in thickness, and it is very commonly lacking. The topography is undulating to rolling, and is due almost entirely to stream work. The hills in this part of the county are, with very few exceptions, hills of erosion.

The valley fill region consists of the flat terrace country extending south from the base of the Late Wisconsin terminal moraine and comprising the southern halves of Johnstown and Harmony Townships, the northern and eastern parts of Janesville and Bradford Townships, the eastern halves of Rock and Beloit Townships, and the western halves of La Prairie and Turtle Townships.

Rock County lies within the drainage basin of the Rock River, which passes through the center of the county from north to south. Most of the drainage in the western tier of townships flows westward and southward into Sugar River, and then southeastward into the Pecatonica River, which empties into Rock River near Rockton, Ill. East of these townships the drainage is largely southeastward to Rock River. The drainage of the eastern part of the county except the northeast corner is largely southwestward through Turtle Creek and other streams into Rock River. The northeast corner is drained northwestward through Otter Creek into Lake Koshkonong. There are many marshes and undrained areas in the northern part of the county, in the Late Wisconsin drift region.

With the exception of Rock River, the streams are sluggish and meandering, flowing through considerable developments of poorly drained flood plains. The Rock River has cut into the old valley fill to a depth ranging from 30 to 120 feet. Outside of the valley-fill region its valley is 50 to 150 feet deep.

The first settlement in Rock County was made in 1835, on the present site of Janesville. The county was formed by an act of the Territorial Legislature of Wisconsin, on December 7, 1836. The early settlers were of Anglo-Saxon descent, and came from Pennsylvania, Illinois, Indiana, and Ohio. Later there was a great influx of German, Norwegian, Irish, and English settlers. All parts of the county are now thickly settled and well developed. The popula-

tion is given in the 1910 census as 55,538, of which 43.2 per cent is rural, averaging 33.5 persons to the square mile.

Janesville, in the central part of the county, is the county seat and chief railroad center. It has a large beet-sugar factory and a number of other factories. Its population is reported in the 1910 census as 13,894. Beloit, situated in the extreme southern part of the county, is the chief manufacturing city, with a population of 15,125. Evansville, with a population of 2,061, has an important pea-canning factory, and Clinton Junction has a condensery. Edgerton is the principal tobacco center.

Rock County is well provided with transportation facilities. The main line of the Chicago & North Western Railway between Chicago and St. Paul passes diagonally across the county. One branch extends from Janesville to Beloit and from there to Chicago, another runs northwestward from Afton and connects with the main line at Evansville, and a third branch connects Janesville, Milton, and Koshkonong. The Chicago, Milwaukee & St. Paul Railway has a branch extending west from Janesville to Brodhead, one connecting Janesville and Milton, another running from Edgerton to Milton and then east through Lima Center to Milwaukee; also other branches. The Rockford Interurban Railroad connects Rockford, Beloit, and Janesville.

Public roads extend into all parts of the county, and the more important ones are kept in good condition. Under the present road-working system all the public roads receive some attention. Through the assistance of the State, roads are being constructed of crushed limestone in various parts of the county. Most parts of Rock County are supplied with rural mail delivery routes and telephone service.

Janesville and Beloit are the principal home markets for agricultural products, and Chicago and Milwaukee the leading outside markets.

CLIMATE.

Almost all of Rock County is included within the Rock River Basin, which is one of the eight climatic provinces in Wisconsin. This province has the longest growing season of any in the State, averaging about 170 days, which is as long as that of central Illinois, longer than that of central Indiana or Ohio, and about equal to that of the Valley of Virginia and that of central Maryland.

The mean annual temperature for Rock County is 47.4° F. The winters here are colder than along the lake, and the spring and summer are warmer. This section is the best corn area in the State. The temperature of the Rock River Basin in summer is similar to that of northern Illinois, Indiana, Ohio, and southwestern Pennsylvania, while in winter it is comparable with that of southern Ver-

mont, northern Iowa, and southern Montana. On seven summer days, on the average, each year the thermometer may go as high as 90° F. and during five winter mornings on an average it may fall to 10° F. below zero or lower. The highest temperature recorded in the county is 105° F., and the lowest −27° F. Such extremes are of rare occurrence and of short duration.

The average date of the last killing frost in the spring is April 20, while the latest date of killing frost recorded is May 20. The average date of the first killing frost in the fall is October 18, while the earliest date of killing frost recorded is September 20. The average growing season in Rock County is 181 days in length.

In the following table are shown the more important climatic data as compiled from the records of the Weather Bureau station at Beloit:

Normal monthly, seasonal, and annual temperature and precipitation at Beloit.

Month.	Temperature.			Precipitation.		
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year.	Total amount for the wettest year.
	°F.	°F.	°F.	Inches.	Inches.	Inches.
December	24.8	63	−25	1.79	1.59	2.69
January	20.2	59	−27	1.80	1.44	2.38
February	20.3	59	−24	1.70	1.69	6.80
Winter	21.8	63	−27	5.29	4.72	11.87
March	34.2	82	−10	2.11	2.75	4.44
April	48.0	89	16	2.69	.45	1.50
May	58.6	91	27	3.69	2.43	3.25
Spring	46.9	91	−10	8.49	5.63	9.19
June	68.0	99	34	3.99	1.54	5.20
July	72.7	105	42	3.69	2.13	6.20
August	70.3	99	35	3.64	.76	.84
Summer	70.3	105	34	11.32	4.43	13.24
September	63.5	94	23	3.58	2.03	4.94
October	51.2	86	13	2.08	.88	5.95
November	37.3	77	− 4	1.95	1.17	2.45
Fall	50.7	94	− 4	7.61	4.08	13.34
Year	47.4	105	−27	32.71	18.86	46.64

AGRICULTURE.

The agricultural history of Rock County dates from the earliest settlement of the region. In the fall of 1835 a small number of pioneers settled on the east side of Rock River, at the present site of Janesville, and at the edge of Rock Prairie, and began farming on

the deep, fertile soil of Rock Prairie, growing wheat as a cash crop and corn, oats, potatoes, and vegetables for subsistence. As more settlers entered, the growing of wheat was extended into various sections of the county, and particularly into the "oak openings," where the trees were so scattered as to permit cultivation without much clearing. About 1845, in the period of more general settlement and farm development, it is reported that 700,000 bushels of wheat were produced in Rock County annually, the yield averaging 30 bushels per acre. After this period considerable trouble was experienced in growing wheat, on account of the blight. In 1862 the chinch bug did considerable damage to the crop, and wheat production gradually gave way to a more diversified system of farming. Corn and oats proved to be profitable, and an important dairy industry gradually developed. Tobacco was introduced into Rock County in the early fifties and was grown on the "prairies" in the northern part. From this beginning tobacco developed into an important crop, and it is still grown extensively in the northern part of the county.

According to the census, there were 74,835 acres in corn in 1879, producing 2,555,704 bushels. Oats occupied 52,528 acres, and produced 1,768,454 bushels. There were 23,420 acres in barley, with a production of 533,892 bushels. The area in wheat was 23,212 acres, with a production of 340,978 bushels and that in hay was 53,169 acres, producing 76,205 tons. Some rye, buckwheat, flax, potatoes, tobacco, and hops were grown, together with about $45,000 worth of orchard and market garden products.

The leading form of agriculture in Rock County today consists of general farming in conjunction with dairying. The principal crops are corn, oats, barley, and hay. Potatoes, rye, wheat, and buckwheat are grown to a smaller extent. The special crops include tobacco, sugar beets, and peas, ranking in importance in the order named.

Corn occupies a larger acreage than any other crop. In 1909, according to the census, 88,511 acres were devoted to corn, which produced 2,941,656 bushels. Principally white and yellow dent varieties are grown. Corn is usually cut with a harvester and husked from the shock, the stover being stacked in the field or shredded and stored in the barn for coarse winter feed. There are 1,550 silos in Rock County, 250 having been built in 1917, and a large part of the corn is used for ensilage.

Oats rank next to corn in importance. This crop is used almost entirely on the farm for feeding stock. The census reports 41,501 acres in oats in 1909, with a production of 1,302,290 bushels.

Barley is grown on all the heavy soils and on a number of farms it is the chief cash crop. In 1909, according to the census, there were 34,539 acres in barley, producing a total of 947,670 bushels.

A mixture of timothy and clover is the most common hay crop. It is usually sown with some small grain as a nurse crop. Medium red is the most popular clover. Considerable difficulty has been encountered in obtaining a good stand of clover, due in part to winter killing during the late winter, when the snow is melting and the ground freezing and thawing alternately, and in part to hot, dry weather during the late summer. With the exception of the Clyde fine sandy loam and silt loam, a more or less acid condition exists in all the soils, and this is detrimental to best results with clover and other leguminous plants. Some alsike clover is grown on the more poorly drained soils. Mammoth clover does well on the lighter soils, but on the heavier types it is coarse and not so satisfactory as the medium red. Many tons of marsh hay are cut each year on the low, swampy areas, but this is of inferior quality.

Rye was grown on 5,498 acres in 1909, with a production of 73,006 bushels. The crop is confined almost entirely to the sandy soils. It is grown for the grain, for green manuring, and for pasturage.

Wheat shows a greater decrease in acreage since 1880 than any other crop. The census reports 553 acres in wheat in 1909, with a production of 11,308 bushels.

Buckwheat is grown to a very small extent, being confined largely to the sandy soils. In 1909, according to the census, there were 294 acres in buckwheat, with a production of 5,232 bushels.

The 1910 census reports 426 acres devoted to emmer and spelt, with a production of 11,442 bushels.

Alfalfa is becoming a very important crop, especially in the dairy districts. Three cuttings are usually obtained, with an average yield of 3 tons per acre per season. Alfalfa does well on many of the soils where proper care has been given the preparation of the seed bed, inoculation, fertilization, and correcting the acidity. There were 649 acres of alfalfa in 1909, with a production of 1,882 tons, and the acreage at present is much greater.

Of the special crops, tobacco is the most important. Of a total of 40,458 acres devoted to this crop within the State in 1909, 6,490 acres were in Rock County, and the output for the county is reported as 7,267,731 pounds. Most of the tobacco grown is of the Comstock Spanish variety. This is a cigar tobacco, and about 85 per cent is sold as binder, the remainder, consisting chiefly of broken leaves, being used as filler. Because of the uncertainty of the yields and prices, and owing to the labor required, the tobacco acreage is being reduced and many of the tobacco growers are engaging in the dairy industry. Tobacco is often grown on the same field year after year, receiving the greater part of the manure, and as a result the remainder of the farm suffers. In order to maintain a very rich soil,

from 20 to 40 loads of stable manure is applied per acre. Tobacco is often the main crop of small farmers or tenants.

Potatoes are seldom shipped out of Rock County, but practically all the farmers produce their own supply, and many have some for sale on the local markets. The best potatoes are produced in the sandy sections. The census reports 3,743 acres in potatoes in 1909, with a production of 466,476 bushels. The Early Rose, Early Ohio, Rural New Yorker, and Peerless are among the varieties most commonly grown.

Sugar beets are grown to a considerable extent in the vicinity of Janesville, where a beet-sugar factory is operated. In 1909, 694 acres were reported in sugar beets, with a production of 8,634 tons, and in 1917, 1,500 acres. It is customary for the farmers to put in the crop and attend to the implement cultivation, while the factory furnishes labor to do the handwork, such as thinning, weeding, and topping.

Peas for canning are grown extensively in the northwestern corner of the county, a canning factory being located at Evansville. To save long hauls, viners have been installed at several points, making possible the extension of the industry beyond the immediate vicinity of the factory. Yields range from 2,000 to 2,200 pounds per acre of shelled peas. The varieties of peas grown are the Alaska, a very early pea, and the Advance, Admiral, and Horsford, which mature later.

Cabbage is grown on a commercial scale east of Beloit, and near Beloit and Janesville market gardening is carried on in a small way, but otherwise trucking has not been developed.

Apples are grown in small orchards on many of the farms, but there are only a few commercial orchards in Rock County. Strawberries, blackberries, raspberries, currants, plums, and grapes are grown to a limited extent, chiefly to supply the family needs.

Dairying is an important industry throughout the county, and especially in the central, northwestern, and eastern parts. The dairy farms usually have from 6 to 30 cows, but there are some larger herds. The income derived from the sale of dairy products amounted to $1,240,484 in 1909. There are a number of cheese factories and creameries and some skimming stations in the county, and a large condensery at Clinton Junction. A number of purebred herds are kept in the county. The Holstein is the predominating breed, followed by Guernsey, Jersey, and Brown Swiss. By far the greater part of the dairy stock is made up of grade stock, with Holstein and Shorthorn blood predominating. Many of the dairy herds are headed by purebred sires, and the stock is gradually being improved.

Considerable numbers of steers are shipped into the county each year from Chicago and from points farther west. On a number of

farms from 10 to 50 head are fed for several months and then sold for beef. Most of the male calves from the dairy farms, of grade stock, are sold for veal. Most of the home-produced cattle sold for beef are old cows which are no longer profitable milk producers, or animals which do not give promise of becoming profitable producers. In 1909, according to the census, there were 18,651 calves and 13,321 other cattle sold or slaughtered, the total income from this source amounting to $2,108,357.

Hog raising is carried on in all parts of the county, but is least developed on the lighter soils in the southwestern fourth of the county. Many of the farmers produce their own pork. The Duroc-Jersey is the predominant breed of hogs, followed by the Ohio Improved Chester White and Poland-China. There are some Berkshires and Hampshires. The 1910 census reports a total of 79,720 hogs in the county.

Most of the farmers raise horses for their own use, and there are about 25 horse breeders who ship out of the county. The Clydesdale is the leading breed, with the Percheron second.

Sheep raising is carried on by a few farmers. The Shropshire is the leading breed. The 1910 census reports a total of 26,735 sheep in the county.

The Carrington gravelly sandy loam, the Bellefontaine gravelly loam, the Rodman gravelly sandy loam, and the Waukesha gravelly sandy loam are too rough for the growing of general farm crops, and farmers realize that they are best adapted to pasturage. It is a well-known fact that crops on low-lying land are most susceptible to frost. All the farmers are beginning to recognize differences in the adaptation of soils to certain crops and varieties, and the majority are guided in a measure by such knowledge, but few carefully select their fields on soils best adapted to a particular crop. It is generally considered that corn does best on the heavy Clyde silt loam and it is well suited to all the heavier, dark-colored soils, such as the Carrington and Waukesha silt loams. On these dark soils, high in organic matter, small grains are apt to lodge, and the quality of the grain is not so good as on the light-colored, heavy types. Peas do best on the Miami silt loam and Fox silt loam, while potatoes of the best texture are grown on the sandy and fine sandy loam soils. The sugar content of beets grown on the Carrington silt loam, Waukesha silt loam, and Clyde silt loam is lower than that of beets grown on the Miami silt loam and Fox silt loam, but the yield is enough higher to give a little better net return. Tobacco is grown most extensively on the Miami and Carrington silt loams, both being well adapted to the crop. The choicest land for tobacco seems to be near areas of Carrington fine sandy loam where a little fine sand is mixed with

the Carrington silt loam. The lighter-textured soils are considered the best for trucking.

The tendency throughout Rock County is toward better methods of cultivation, fertilization, and seed selection, and as a result yields are being increased. Where the soil is droughty but not subject to erosion, fall plowing has been found helpful in the conservation of moisture. Often the heavy sod soils are plowed in the fall. It is customary to apply stable manure to land that is to be plowed for corn, but if the land is plowed in the fall the manure is often hauled out during the winter and scattered over the plowed surface. When stubble land is plowed in the late summer manure is frequently applied before plowing. Where tobacco is grown it receives practically all of the manure, and the field soon becomes the richest on the farm. It is easier to use the field year after year than to change the crop, and tobacco has often been grown in the same field for 5 to 10 years, and in some instances for 15 years. Throughout the county most of the farmers plan to seed their land to grasses at least once every four or five years.

The farm buildings, including the dwellings, are generally large and substantial. The barns usually have a stone or concrete foundation. Most of the dairy farms have a silo. The fences are good, many of them being of woven wire. The work stock consists of draft horses, of medium to heavyweight. The farm machinery in general use includes 2 to 4 horse turning plows, smoothing harrows, disk harrows, large riding cultivators, mowing machines, hay rakes, tedders, loaders, and binders. There are a number of traction engines used for breaking. Machines for thrashing grain travel about the country serving the farmers soon after harvest.

Definite systems of crop rotation are followed by some farmers. One in common use on the light-colored, heavy soils consists of corn one year, followed by oats, and this by barley or wheat seeded with timothy and clover. Hay is usually cut for 2 years before the field is again plowed for corn. On the prairie soils corn is often grown for 2 years in succession, and followed by a grain and hay crop. Where erosion is an important factor and little corn is grown, the rotation often consists of grain for 2 years, followed by clover and timothy for 2 or more years. Some of the better tobacco planters grow the crop on one field only 3 to 5 years, follow it with corn for 1 or 2 years, and seed the field to grass for several years before putting it in tobacco again.

Practically all farmers use barnyard manure for corn. In a few cases ground limestone has been applied to correct the soil acidity, and ground rock phosphate or acid phosphate has been used for grain or corn. The census reports $4,607 expended for fertilizer in 1909, on 102 farms.

Farm labor in this section is scarce, and the members of the family do most of the farm work. Farm laborers are usually paid $30 to $50 a month, with board. During the haying and harvesting period day laborers are paid $2 to $3. During the season of 1917 tobacco laborers, hoeing and harvesting the crop, received $3.50 to $6 a day.

The 1910 census reports the number of farms in the county as 3,787, comprising 95.9 per cent of the total land area. The average size of the farms in 1910 was 116 acres, of which 95 acres, or 81.8 per cent, was improved. The percentage of farms operated by owners was 66.8 per cent, by tenants 32.4 per cent, and by managers 0.8 per cent. Ordinarily where the landlord supplies the work stock and tools he receives two-thirds of the crop. Where the tenant supplies these in addition to his labor the landlord receives one-half of the crop.

The selling price of the better farming land ranges from $125 to $300 an acre, depending on the quality of the soil, the topography, the improvements, and the accessibility of markets. The highest priced lands, excluding farms near the cities and towns, are the level to gently rolling, heavy soils, especially the silt loams. The more rolling areas of heavy soils, together with the sandy loams, range in valuation from $75 to $125 an acre, while the areas of deeper sand types and some areas subject to inundation are valued at $40 to $75 an acre. The average assessed value of farm land is given in the 1910 census as $68.85 an acre.

SOILS.

The soils of Rock County, on the basis of origin, may be classed in four general groups, viz, soils derived from glacial drift, those derived from the underlying rock, those derived from water-laid materials, and cumulose soils derived from decaying vegetation.

As already stated, the Late Wisconsin drift, of the Pleistocene period, is the surface formation in the northern part of the county. A loessial blanket, ranging in thickness from 1 to 4 feet, usually covers this glacial till. Pre-Wisconsin drift, 10 to 100 feet thick, and having a loessial blanket ranging from 2 to 10 feet in thickness over the heterogeneous till, occurs in the southeastern fourth of the county. Shallow pre-Wisconsin drift occupies most of the region lying south of Marsh Creek and west of Rock River. It includes some small morainic areas east of Footville and northwest of Janesville, where the till bed is 40 to 100 feet thick, but the average thickness is only 5 or 6 feet in Center, Janesville, Plymouth, Rock, Newark, and Beloit Townships, while in Magnolia, Spring Valley, and Avon Townships this drift ranges from a few scattered bowlders and gravels to a layer 5 or 6 feet in thickness, averaging about 2 feet.

The loesslike covering is much less conspicuous west of Rock River than east of it, rarely ever exceeding 3 feet in thickness and being largely absent in Beloit, Newark, Avon, and Spring Valley Townships.

The underlying rock formations in this county dip slightly to the east and outcrop extensively in Magnolia, Spring Valley, Avon, and Newark Townships, where some of the soil has been derived from their disintegration. The oldest formation within the area is the St. Peters sandstone, which outcrops on the steeper slopes in the western part of the county and to a limited extent along the steep valley slopes of Rock River. It is the surface rock in the region along Bass and Marsh Creeks, and in the region along Rock and Sugar Rivers. Immediately overlying this formation is the Trenton limestone, which, together with the much less extensive overlying Galena limestone, caps many of the hills in the western part of the county and frequently outcrops on steep slopes and narrow ridges in the area lying south of Marsh Creek and west of Rock River. There are a few scattered outcrops of these formations in the southeastern quarter of the county. Except for the areas of St. Peters sandstone mentioned above, and very limited occurrences of the Lower Magnesian limestone along Bass Creek and Sugar River, they are the underlying rocks of the entire county.

The valley fills lying south of the Late Wisconsin terminal moraine, and comprising a large portion of Janesville, Harmony, Johnstown, Rock, La Prairie, Bradford, Beloit, and Turtle Townships, are made up of stratified beds of gravel and sand usually overlain by a blanket of silty material. Other waterlaid deposits are represented by the outwash plain extending east and west, and lying south of Milton Junction; the valley fill along Marsh Creek; the broad terraces along Sugar River in Avon Township and the western parts of Spring Valley and Magnolia Townships; and the extensive flood plains along Sugar River and Bass Creek.

Each of the soil groups is subdivided into series and types. The series include soils having a common origin and similar characteristics in color, structure, topography, and drainage. The type differentiation within any series is based upon the texture, determined by the proportion of the different grades of sand, silt, and clay found in the soil. Minor variations in the soil, not of sufficient importance to be designated as type differences, are indicated as soil phases.

The soils derived from the glacial formations are classed in the Miami and Carrington series. About 5 per cent of the area of the Clyde soils also belongs to this group. These soils owe their origin to the weathering of calcareous till, which runs high in limestone gravel. The heavier members of these series are usually modified by

loess, and in some cases are derived almost entirely from loess, especially where the blanket of loess is 3 feet or more in thickness. The Union, Crawford, and Boone soils belong to the group of soils derived from the underlying rock formations. The first-named two series have come from the Trenton and Galena limestones, while the Boone owes its origin to the St. Peters sandstone. To the waterlaid group belong the Fox, Rodman, Plainfield, and Waukesha soils and 95 per cent of the area of the Clyde soils, all these types having been derived from the underlying stratified material. The Peat has originated from the partial decomposition of mosses, grasses, sedges, and other vegetation in the presence of water.

The soils of the Carrington series are dark brown to black, and the subsoils are dingy brown to yellowish brown. These soils occupy gently undulating to rolling areas, and the drainage is good except in the more level parts of the heavier types.

The soils of the Bellefontaine[1] series are grayish brown to brown and underlain by reddish-brown heavier subsoils, which at depths of 2 to 2½ feet rest upon porous stony and gravelly till, very largely of

[1] In the early mapping in the Middle West the light-colored soils developed from calcareous glacial drift of Wisconsin glacial age were placed in the Miami series. The light color, due to development under timber cover, and the derivation from calcareous drift were the two criteria on which the differentiation was made. As mapping proceeded and wider experience with the soils of the country was gained it was found that many other characteristics which gradually became recognized as having great importance in determining soil value were developed from place to place within the area of these light-colored soils and that all areas could not therefore be considered identical regardless of the fact that they were all light in color and derived from identical or very similar material. For example, some areas were found with four members or distinct horizons in the soil section instead of three as in the typical Miami, and some areas had somewhat lighter textured subsoils than the typical and as a consequence were more thoroughly drained, oxidized, and leached. These differences were noticed in the early work, but it was not until broad experience had been gained by the study of soils in widely separated localities that they were regarded as sufficient to warrant the separation of the soils characterized by them into new series. As time went on, however, the Miami series was restricted to a narrower range of characteristics and new series were created to cover other characteristics. The Bellefontaine series was created to cover light-colored (brown) soils with thoroughly drained and oxidized slightly reddish-brown subsoils from which the carbonates have been leached to a depth of 3 feet or more.

When Dane County, Wis., was mapped in 1915, the Bellefontaine had not yet been differentiated from the Miami in Wisconsin, so the light-colored soils with well-drained subsoils, derived from calcareous glacial drift were all mapped as Miami. Before Rock County was finally finished in summer of 1919, however, it had been decided that this differentiation should be made in that county so that in many places along the boundary between Rock and Dane Counties, as well as between Rock and Jefferson Counties, Bellefontaine soils lie on the Rock County side of the boundary against Miami soils on the Dane or Jefferson County side. Parts of the area mapped as Miami in the latter two counties would be mapped at present as Bellefontaine on account of the presence of a reddish-brown subsoil and a soil somewhat browner than is the case in the Miami as now defined. The difference between them is not wide and for the purposes of general agricultural use there is no essential difference. Under a very intensive utilization of the land the difference would probably become manifest. The members of the series can be identified in Dane and other counties where the differentiation was not made by the reddish-brown color of the subsoil, a slightly browner color of the soil and an occurrence in areas somewhat more rolling than is true of the Miami.

limestone origin. The topography is undulating to rough, as characterizes morainic areas. According to the topography, the drainage is good to excessive.

The soils of the Miami series are light grayish brown, underlain by yellow to yellowish-brown, heavier subsoils, which are sometimes mottled with brown, light gray, and drab in the lower part. The surface is gently undulating to rolling, and drainage is usually adequate except in some of the gently undulating areas of the heavier types.

The surface soil of the Clyde series is dark brown to black, overlying gray, drab, or mottled gray and yellowish subsoils. The members of this series have been formed in lakes, poorly drained areas, ponded valleys, and kettle basins within glaciated regions, through the influence of poor drainage and the accumulation of organic matter acting on the original glacial till of the basins or on accumulations of water-laid material washed into and deposited on the floor of the basins.

The soils of the Union series are light brown to brown, with reddish-brown to reddish-yellow subsoils giving way to weathered limestones within the 3-foot section. The topography is rolling and the surface drainage is good.

The Boone series is characterized by light-brown to brown surface soils and yellow subsoils. The members of this series occupy gently rolling to steeply sloping uplands.

The surface soils of the Crawford series are dark brown to almost black, with dark reddish brown subsoils, usually underlain by weathered limestone within 13 inches of the surface. The topography is rolling and the drainage good.

The types included in the Fox series have light-brown to brown surface soils and yellowish-brown to brown subsoils, sometimes mottled with yellow and drab in the lower depths. The surface is level, but the soils are drained here and there by potholes or by valleys eroded since the deposition of the material as outwash plains, or as terraces along streams within the glacial areas or flowing out of it. The soils therefore consist largely or wholly of glacially derived material. They are typically high in limestone gravel.

The soils of the Rodman series range in color from light brown to brown or reddish brown. The subsoils are of similar color, but consist of beds of loose sand and gravel. These soils consist of waterlaid drift and occur on kames or outwash plains.

The soils of the Plainfield series are light brown to brown, and the subsoils are light brown to yellow. These soils occur on terraces, and the subsoil and substratum are loose and porous.

The surface soils of the Waukesha series are dark brown to black, and the subsoils are dingy brown to yellow. The surface is level, but the drainage is good. These soils are derived from water-assorted glacial debris deposited in broad filled-in valleys or as outwash plains and terraces.

In following pages of this report the various soils of Rock County are described in detail and their relation to agriculture discussed. The distribution of the soils is shown on the accompanying map, while the table below gives the name and the actual and relative extent of each type mapped:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Carrington silt loam	67,712	19.1	Carrington loam	9,088	1.9
Shallow phase	19,776		Union silty clay loam	7,424	1.6
Miami silt loam	51,328	13.8	Fox loam	4,864	1.6
Deep phase	11,840		Light-textured phase	2,496	
Waukesha silt loam	21,760	13.7	Waukesha sandy loam	5,888	1.3
Deep phase	41,280		Boone fine sandy loam	4,672	1.0
Clyde silt loam	52,672	11.5	Miami loam	3,712	.8
Bellefontaine silt loam	37,056	8.1	Waukesha gravelly sandy loam	3,584	.8
Miami fine sandy loam	24,512	5.3	Bellefontaine loam	2,432	.5
Peat	7,040	2.9	Waukesha sand	2,240	.5
Shallow phase	6,208		Carrington gravelly sandy loam	1,664	.4
Bellefontaine gravelly loam	13,184	2.9	Rodman gravelly sandy loam	832	.2
Waukesha loam	12,672	2.9	Plainfield fine sand	768	.2
Sandy phase	256		Crawford clay loam	192	.1
Fox silt loam	12,736	2.8	Total	458,240	
Carrington fine sandy loam	9,728	2.1			
Bellefontaine fine sandy loam	9,344	2.0			
Clyde fine sandy loam	9,280	2.0			

CARRINGTON GRAVELLY SANDY LOAM.

The Carrington gravelly sandy loam to a depth of about 7 inches is a dark-brown, gravelly sandy loam, high in organic matter. This is underlain by a yellowish-brown, gravelly sandy loam which becomes heavier with increase of depth, until a gravelly sandy clay is encountered at about 24 inches. This often continues to a depth of 3 feet or more. Crystalline bowlders are common, both on the surface and in the subsoil, and in many places, especially on kames and eskers, stratified beds of gravel and sand are encountered in the 3-foot section. In such cases the surface soil of gravelly sandy loam passes at about 7 inches into yellowish-brown gravelly sandy loam, which grades downward into the beds of gravel and sand.

The Carrington gravelly sandy loam is confined to a number of small areas scattered throughout the larger areas of the Carrington soils west of Rock River and in Milton and Fulton Townships. The largest area is east of Footville, in Plymouth Township.

The surface is ridgy and very broken. Where the type occurs in the region of Late Wisconsin drift near Fulton it contains numerous kettle basins, but the areas in the pre-Wisconsin drift are thoroughly drained by streams. Much of the type is encountered on kames and eskers which belong to either the Late Wisconsin or the pre-Wisconsin drift. The drainage is everywhere sufficient, and in many places excessive.

This type is of little importance, only about 20 per cent of it being under cultivation. The remainder is used for permanent pasture. Corn, oats, barley, and hay are grown. The yields are somewhat lower than on the Carrington fine sandy loam. If the suggestions made for the improvement of the Carrington loam were put into practice on this soil it would be well adapted to the growing of alfalfa.

CARRINGTON FINE SANDY LOAM.

The Carrington fine sandy loam, to a depth of about 10 inches, is a dark-brown to almost black fine sandy loam, high in organic matter. A small quantity of gravel and sometimes limestone and chert fragments are scattered over the surface and mixed with the soil. Litmus-paper tests indicate that the soil is in a very acid condition. The upper subsoil is usually a yellowish-brown fine sandy loam, grading at 16 to 20 inches into a sandy clay loam or sandy clay, which often extends to depths of 3 feet and more. In many places, however, the underlying limestone is within the 3-foot section, and in such places from 4 to 6 inches of reddish-brown, rather plastic sandy clay, containing particles of decomposed limestone, usually overlies the rock. In these cases the lower subsoil has come from the weathering of the underlying limestone. In other places the yellowish-brown fine sandy loam or sandy clay of glacial origin rests on the limestone. No residual material from the limestone is present in the surface soil.

Except for a few small areas south of Fulton and west of Evansville, the Carrington fine sandy loam is confined to the southwestern quarter of Rock County. Its principal occurrence is in Beloit Township. The topography is gently rolling to rolling, and drainage is everywhere sufficient, being excessive where the limestone is near the surface.

Probably 80 per cent of the Carrington fine sandy loam is cultivated. The crops grown and the farm methods are practically identical with those on the Carrington loam. Corn yields from 20 to 35 bushels per acre, oats from 25 to 35 bushels, rye from 20 to 30 bushels, tobacco from 900 to 1,200 pounds, and Irish potatoes about 125 bushels.

Land of this type sells from $75 to $125 an acre, depending on the location and improvements.

The needs of this type and the methods of improvement are practically the same as those suggested for the Carrington loam.

CARRINGTON LOAM.

The soil of the Carrington loam is a dark-brown to almost black, friable loam, 8 to 12 inches deep, comparatively high in organic matter. The upper subsoil is a dingy-brown loam to light clay loam, passing at about 17 inches into a yellowish-brown sandy clay loam which becomes heavier with increase of depth and grades into a sandy clay, the latter continuing to a depth of 36 inches or more. Considerable gravel is present in both soil and subsoil, and bowlders are common. In many places the underlying limestone is encountered in the 3-foot section, and in such situations a gritty, red clay, carrying fragments of weathered limestone, overlies the rock. There are many small inclusions of Carrington fine sandy loam and silt loam, and in places the fine sandy loam inclusions are so numerous that it is difficult to determine the predominating type. On some of the steep slopes the surface soil has been removed by erosion, and the sandy clay loam or sandy clay subsoil is exposed. Where this type borders the Miami soils it is lighter in color and contains less organic matter than typical.

The Carrington loam is most extensive in Beloit and Newark Townships, but areas ranging from a few acres to two hundred acres are scattered throughout most of the region west of Rock River.

The topography is gently rolling to rolling, and the drainage is good. Where proper precaution has not been taken, deep gullies have developed on the steeper slopes.

Probably 80 per cent of this type is cultivated. The remainder supports a growth of prairie grasses and is used for permanent pasture. General farming in conjunction with dairying is the chief type of agriculture with oats, corn, barley, and hay the leading crops. Tobacco is the only special crop grown. Corn yields 25 to 45 bushels, oats 25 to 45 bushels, barley 25 to 40 bushels, mixed timothy and clover hay from 1 to 1½ tons, and tobacco from 1,000 to 1,400 pounds per acre. The farming methods on this type are similar to those followed on the Carrington silt loam.

The selling price of this land ranges from $75 to $125 an acre, depending upon the location and improvements.

Much of the Carrington loam is in a very depleted condition. To correct the acidity an acreage application of 4,000 to 5,000 pounds of finely ground limestone should be made, and the use of about 1,000 pounds of rock phosphate per acre would improve the pro-

ductiveness. For immediate results, 200 to 300 pounds of acid phosphate could be used with grain, or 400 to 500 pounds per acre with corn. The methods of applying the lime and phosphorus suggested for the Carrington silt loam will be suitable also for this type. The supply of nitrogen and organic matter should be increased through the use of barnyard manure and the growing of clover. Some definite system of rotation should be planned, so that clover sod may be plowed under once every 3 or 4 years. Cultivation of the steeper slopes is followed by gullying unless the slopes are seeded to soil-binding crops, such as bluegrass or alfalfa. Plowing with the contour would help to maintain the hillside soils.

CARRINGTON SILT LOAM.

The Carrington silt loam to 12 or 14 inches consists of a dark-brown to almost black, smooth silt loam, rich in organic matter. The upper subsoil is a dingy-brown silt loam, grading downward into a yellowish-brown or brownish-yellow silt loam. The lower subsoil is a yellowish-brown silty clay loam, grading into a silty clay, which continues to a depth of 3 feet or more. The entire 3-foot section is almost free from gravel, stones, and bowlders, and is remarkably uniform in its loesslike structure and texture. Immediately below this loesslike mantle, which varies from 3 to 8 feet in thickness, the typical glacial till, consisting of clay, silt, sand, and gravel, is encountered. The line of demarcation between this and the yellowish-brown or brownish-yellow silty clay is well defined, the upper part being free from bowlders and gravel and leached free of calcium carbonate, while the till is filled with stones and bowlders and is well supplied with calcium carbonate. Both Truog and litmus tests indicate that the surface soil is in an acid condition.

As mapped, the Carrington silt loam is subject to some variations. In the northern part of the county, in the region covered by the Late Wisconsin drift, and in all the occurrences of the type west of Rock River and south of the Late Wisconsin terminal moraine, there are numerous inclusions of a shallow phase of the type in which the lower subsoil is a sandy clay or silty clay carrying some gravel. Where the Carrington silt loam borders the Miami silt loam it is somewhat lighter colored and contains less organic matter. Where it borders the Clyde silt loam the lower subsoil often shows yellow and drab mottlings.

The Carrington silt loam is an extensive and very important soil. Its largest and most typical development occurs in the southeastern quarter of the county. It is also developed in large areas in the central portion and northwestern quarter and small areas occur in all the townships of the county.

The surface of this type ranges from almost level or undulating to gently rolling. Drainage is usually well established, but in some of the more nearly level areas tiling is needed. The structure of both soil and subsoil is very favorable for the retention of moisture, and there is little serious erosion, as the run-off is usually gentle.

Practically all of this type is or has been tilled. The prevailing system of agriculture is based upon general farming in conjunction with dairying. The native growth consists of prairie grass, with some oak, maple, basswood, elm, and hickory near the boundaries of other types.

Corn, oats, barley, and hay are the leading crops. Alfalfa and wheat are grown to a small extent. Tobacco and sugar beets are important special crops. There are a few apple orchards on this type, and small fruits and berries also are grown for home use. Corn ordinarily yields 40 to 45 bushels per acre, but where the better methods of farming are followed yields of 60 to 75 bushels per acre are not uncommon. Oats yield 40 to 60 bushels per acre, barley 35 to 55 bushels, and mixed clover and timothy hay 1½ to 2 tons per acre. Tobacco yields 1,000 to 1,600 pounds per acre, and sugar beets 10 to 16 tons. The sugar content is not as high as that of beets grown on the Miami silt loam, but the yield is greater.

Very little attention is given to a systematic crop rotation on this soil, largely as a result of the importance of tobacco, which is usually grown on the same field for a number of years and seldom in a rotation. When it is alternated with the general farm crops the rotation generally consists of corn, followed by a small grain which is seeded to timothy and clover, tobacco then being grown for 2 or 3 years and followed by corn. In sections where tobacco is not grown the rotation most commonly followed consists of corn, a small-grain crop for 2 years, and timothy and clover. Hay may be cut for 2 years and the field pastured for a year before being again plowed for corn. Fall plowing is done to some extent for oats and corn. Stable manure is about the only fertilizer used for general farm crops, and where tobacco is grown the greater part is applied to the tobacco field.

Land of the Carrington silt loam type has a selling value of $125 to $300 an acre, depending on the location and the state of improvements.

A number of examinations by the State Soils Laboratory of Wisconsin show that the Carrington silt loam is in an acid condition, very deficient in phosphorus, and slightly low in nitrogen. The acidity can be corrected by thoroughly mixing with the soil from 2 to 2½ tons of finely pulverized limestone per acre. Liming should be done on plowed land, either in the fall or in the spring, and it will greatly

assist in obtaining a good stand of either clover or alfalfa. The deficiency in phosphorus can be remedied by mixing 1,000 pounds of rock phosphate per acre with the manure, or by plowing it under with either green clover or green rye. For immediate results acid phosphate can be mixed either with manure or applied as a top dressing directly to the land at the rate of about 200 to 300 pounds per acre for grain, or 400 to 500 pounds for corn. The nitrogen and organic supply can be increased by the use of barnyard manure, and especially by growing clover. Some definite rotation should be planned so that clover sod and possibly a second growth of clover may be plowed under once in every 3 or 4 years.

The level or gently undulating areas of this type are in need of tile drainage, which would permit the soil to warm up early in the spring, so that it could be worked more readily into a mellow seed bed and a more rapid, vigorous growth of crops induced.

Carrington silt loam, shallow phase.—The surface soil of the Carrington silt loam, shallow phase, consists of a dark-brown to almost black, friable silt loam, comparatively high in organic matter. It usually contains some fine sand, and often a small quantity of gravel. The Truog and litmus tests indicate that the surface soil is in an acid condition. The subsoil consists of a rather friable, dingy-brown silt loam, grading downward into a yellowish-brown silty clay loam which carries some fine sand and gravel. At about 20 to 30 inches a sandy clay, or sometimes a sandy loam, is encountered. The deep subsoil grades into typical glacial till, composed of a heterogeneous mixture of clay, sand, gravel, and bowlders. In many rather large areas in the old glacial-drift region, lying south of the late Wisconsin terminal moraine and west of Rock River, where the limestone is within 4 feet of the surface, the lower subsoil is a reddish-brown clay, carrying fragments of weathered limestone, from which it has originated. In places limestone fragments occur in both soil and subsoil. Where the type borders the Miami silt loam it is lighter in color and runs lower in organic matter than elsewhere, while bordering the Miami loam or fine sandy loam or the Carrington loam or fine sandy loam both soil and subsoil contain more fine sand. On some of the steep slopes the soil has been removed by erosion and the till bed is exposed, while in other places the clay loam subsoil comes to the surface. The phase as mapped includes small areas of Carrington loam and fine sandy loam.

The Carrington silt loam, shallow phase, is extensively developed in this county. Its principal occurrence is west of Rock River in the pre-Wisconsin drift region, and between Fulton and Cooksville in the region of Late Wisconsin drift. The surface varies from gently rolling to rolling. In the area of Late Wisconsin drift, in

the northern part of the county, the surface is in many places interrupted by kames and eskers and other morainic hills, and on the whole is of a morainic character while in the region of pre-Wisconsin drift, west of the Rock River, the topography is almost entirely developed by erosion. On account of the sloping surface and the permeable nature of the soil and subsoil, the natural drainage is good. On some of the steeper slopes, where proper care has not been taken, destructive erosion has developed.

This is an extensive and important soil in Rock County. Probably 80 per cent of it is under cultivation, the remainder being devoted to permanent pasture. General farming in conjunction with dairying is the leading type of agriculture. Like the typical Carrington silt loam, this is a prairie soil, and the native growth consists almost exclusively of prairie grasses.

Corn, oats, barley, hay, and tobacco are grown successfully on this soil, but yields are somewhat lower than on the typical Carrington silt loam. The soil is handled and fertilized in the same way as the typical silt loam.

Land of this phase ranges in selling value from $75 to $140 an acre, depending upon the location and improvements.

With the exception of tiling, the suggestions made for the improvement of the typical Carrington silt loam are also applicable to its shallow phase.

BELLEFONTAINE GRAVELLY LOAM.

The Bellefontaine gravelly loam to a depth of 6 to 10 inches is a light-brown to brown loam, carrying considerable gravel. The subsoil is a yellowish-brown to reddish-brown, friable gravelly loam or gravelly clay loam. Many small areas of gravelly fine sandy loam, fine sandy loam, loam, and silt loam are included with the Bellefontaine gravelly loam. North of Johnstown and Johnstown Center the inclusions of Bellefontaine silt loam are so numerous that it is difficult to determine whether it or the gravelly loam is the predominating type.

The Bellefontaine gravelly loam is quite extensive throughout the northern part of Rock County, and except for the areas between Janesville and Leyden, it is confined to the region covered by the Late Wisconsin drift. The surface ranges from gently rolling to very much broken, with numerous hummocks, kettle basins, and ridges. Except in the kettles and other basins the drainage is good or even excessive.

Probably 20 per cent of the Bellefontaine gravelly loam is under cultivation. The remainder is covered with a growth of oak, hickory, and some maple, and is used for permanent pasture. Corn, oats,

rye, clover, and timothy are the principal crops grown. The yields and farming methods are about the same as on the Bellefontaine fine sandy loam.

Only the less rolling parts of this type should be cultivated, the remainder being kept in grass. More organic matter should be placed in the soil by applying barnyard manure or plowing under green-manuring crops.

Small areas of Bellefontaine gravelly fine sandy loam are included with the gravelly loam in the northern part of the county. The soil to a depth of 6 to 8 inches is a light-brown fine sandy loam, containing some gravel and scattered bowlders. The surface inch in virgin areas often has a dark-brown to dark-gray color, due to an accumulation of organic matter. The subsoil is a yellowish-brown to reddish fine sandy loam, or gravelly fine sandy loam, passing at 20 to 24 inches into glacial till. On many small areas the gravelly, light-brown surface soil is underlain with stratified beds of gravel and sand, the soil here representing the Rodman gravelly fine sandy loam.

BELLEFONTAINE FINE SANDY LOAM.

The surface soil of the Bellefontaine fine sandy loam, to a depth of 8 to 10 inches, is a grayish-brown fine sandy loam to sandy loam. The subsoil in the upper part is a yellowish-brown or slightly reddish brown heavy fine sandy loam, sandy loam, or loam, grading at a depth of 12 to 18 inches into a reddish-brown gritty clay loam, and this giving way at a depth of 24 to 30 inches to a porous mass of gravelly and stony material, only slightly weathered and highly calcareous.

Small quantities of gravel and some stones and bowlders occur on the surface, and the entire soil section may be slightly gravelly, while the substratum is made up of little else than sand, gravel, and stones very largely of limestone origin.

The Bellefontaine fine sandy loam occurs in a number of areas scattered over the northern part of the county in the Late Wisconsin glaciation, the largest bodies forming almost a continuous strip along the northern edge of Lima and Milton Townships. The topography ranges from rolling to rather rough and hilly, and all areas are naturally well drained.

The Bellefontaine fine sandy loam is not a very extensive type, but it is fairly important agriculturally, a large proportion of it being under cultivation. The native forest growth consists mainly of maple, oak, hickory, elm, beech, ash, and walnut. All the general crops of the region are grown and give fair to very good yields, but on the average not so good as obtained from the Bellefontaine silt loam.

Corn ordinarily yields from 20 to 45 bushels, oats 20 to 50 bushels, wheat 15 to 25 bushels, rye 10 to 20 bushels, timothy and clover hay 1 to 2 tons, and alfalfa hay 3 to 5 tons. Fair yields of tobacco are produced. Apples can be grown very successfully, but little or no attention is given commercial production.

It is probable that the soil is in a slightly acid condition, and light applications of lime would prove beneficial. As a general rule the organic matter content of the soil is too low to give the best results with any of the field crops. This can be remedied by a more systematic rotation of crops, plowing under green crops as often as possible, and applying all of the available stable manure.

The price of the Bellefontaine fine sandy loam ranges from $75 to $125 an acre.

BELLEFONTAINE LOAM.

The surface soil of the Bellefontaine loam is a brown loam 8 to 10 inches deep, usually somewhat gravelly. The subsoil is a reddish-brown clay loam, changing at a depth of 20 to 30 inches into a gravelly clay loam or loam, and this within a few inches giving way to a porous mass of stony and gravelly till, composed very largely of limestone material. A highly calcareous substratum lying within less than 3 feet of the surface is a constant characteristic of the type. The depth varies from place to place, coming so near the surface in some areas that the soil approaches the nature of a gravelly loam or gravelly sandy loam. Occasional crystalline rock bowlders are to be found upon the surface and through the soil section and substratum.

The Bellefontaine loam is a type of small extent in Rock County, occurring in several widely scattered areas in Milton, Porter, Janesville, and Union Townships. It is confined to the deep morainal deposits of the Late Wisconsin stage of glaciation and the topography is typically morainic, or undulating to very irregularly rolling, with knolls, ridges, and depressions occurring in rapid succession.

A very large proportion of the type is cleared and under cultivation. The remaining forest areas support a good growth of hardwood, principally oak, hickory, and maple. All of the common crops are grown and do well. Corn yields from 25 to 45 bushels per acre, oats 25 to 50 bushels, and timothy and clover from 1 to 2 tons. Not much of type is used for alfalfa, but it should prove especially adapted to this crop. It also makes excellent pasture land.

The manurial requirements and crop adaptation of this soil are not much different from those of the Bellefontaine silt loam. On the whole, however, it is not quite as desirable as the silt loam member of the series, on account of the more irregular and choppy topography it occupies, making the use of improved machinery more difficult.

BELLEFONTAINE SILT LOAM.

The surface soil of the Bellefontaine silt loam to a depth of 6 to 8 inches is a grayish-brown to brown mellow silt loam. Below the soil is a yellowish-brown to slightly reddish brown silt loam layer extending to a depth of 12 to 18 inches, where it gives way to the subsoil proper, which is a reddish-brown compact silty clay loam. At a depth of 24 to 30 inches the subsoil changes to a friable gravelly loam, moderately calcareous, and this within a few inches into a porous mass of unweathered stony and gravelly till composed very largely of limestone material. The soil is slightly gravelly in most areas, and usually carries enough sand of the different grades to give it a gritty feel. Some crystalline rock bowlders occur on the surface and throughout the soil section and substratum. The organic matter content of the soil is rather low.

As mapped the type includes numerous small spots of other types, especially of the Bellefontaine gravelly loam, loam, and fine sandy loam, as well as areas approaching very closely the characteristics of the Miami silt loam. The more sandy and gravelly areas are generally found on the more pronounced knolls and steep slopes, while the siltier areas include the gently undulating stretches where very little erosion is taking place. The characteristics distinguishing this from the Miami silt loam are the brown color of the surface soil, the reddish tinge of the subsoil, and the shallow depth to a porous mass of highly calcareous material. The native vegetation, as well as the experiences of the farmers operating on this type, would indicate that the soil is in a less acid condition than is the case in the Miami silt loam.

The Bellefontaine silt loam is extensively developed in the northern part of the county, mainly in Lima, Johnstown, Milton, Harmony, Fulton, Porter, and Union Townships. It occupies most of the territory embraced in the terminal moraine of the Late Wisconsin glacier and similar morainic areas to the northward.

The topography ranges from moderately undulating to choppy and broken, although in the roughest morainic areas it usually gives way to the gravelly and sandy members of the series. Most areas are smooth enough to allow the use of all types of improved machinery in planting, cultivating, and harvesting crops. Both surface and internal drainage are good.

It is estimated that 75 per cent or more of the Bellefontaine silt loam is cleared and under the plow. It is used principally in the production of corn, oats, and hay—mixed clover and timothy. Tobacco also is locally important and a considerable acreage is devoted to rye, barley, alfalfa, Irish potatoes, beans, and wheat. Nearly every farm has a few apple trees, but there are no important commer-

cial orchards to be seen. The yields of all crops are somewhat greater than on the Miami silt loam, alfalfa in particular giving more satisfactory results. Corn yields from 25 to 50 bushels, oats and barley about the same as corn, mixed clover and timothy hay, 1 to 2 tons, wheat 15 to 30 bushels, tobacco 900 to 1,500 pounds per acre.

Farms located upon this type are held at prices varying from $75 to $200 an acre, depending upon the smoothnesss of the surface, the location, and the state of improvement.

What has been said in regard to the improvement of the Miami silt loam applies equally as well to the Bellefontaine silt loam, except that the need for lime is not so urgent. Good stands of alfalfa are easily obtained and the type is especially well adapted to the growing of this crop. Clover also makes excellent growth and does not seem to suffer for lack of lime in the soil.

MIAMI FINE SANDY LOAM.

The Miami fine sandy loam consists of a light-brown fine sandy loam, low in organic matter, and usually in an acid condition, underlain at 8 to 10 inches by a brownish-yellow or yellow fine sandy loam, which gradually becomes heavier until a sandy clay loam or sandy clay is encountered at 15 to 24 inches. This continues to a depth of 3 feet or more.

The type as mapped is not uniform. In numerous small areas, mainly along ridge crests or on steep slopes where erosion has carried away the surface soil, the fine sandy loam extends to a depth barely exceeding 6 to 10 inches, and rests on yellowish sandy clay, while at the base of slopes, where washed-down materials have been deposited, the light-brown sandy layer extends to depths of 6 to 20 inches, passing into yellow fine sandy loam which sometimes continues to a depth of 3 feet, but usually gives way to a yellowish sandy clay in the lower part of the 3-foot section. In the western part of Rock County, where the pre-Wisconsin drift is very thin and rock outcrops are common, the limestone rock is sometimes encountered within the 3-foot section, the lower subsoil here being a heavy, reddish-brown clay, derived from the limestone. Many small areas equivalent to a light phase of the Miami loam and a loamy phase of the Miami fine sand are included with the Miami fine sandy loam as mapped. In the southwestern part of Newark Township and the southeastern part of Avon Township small areas of sandy loam are included with the type.

The Miami fine sandy loam is extensively developed in Newark Township. A number of small areas occur throughout Spring Valley and Avon Townships and west of Rock River in Beloit Township.

The topography ranges from gently rolling to rolling, and drainage is usually well established. In the more sandy areas it is often excessive.

Probably 80 per cent of this soil is farmed. It is held in esteem because of its easy tillage and quick response to fertilization. The soil is fairly productive. Corn occupies an acreage about 30 per cent greater than that in oats or mixed clover and timothy, the next most important crops, rye, barley, tobacco, Irish potatoes, buckwheat, alfalfa, beans, wheat, and melons, ranking in acreage in the order named, are extensively grown. There are a number of small apple orchards, but the fruit is usually of inferior quality.

Corn ordinarily yields 20 to 35 bushels per acre, but where the farmers have employed better methods of cropping and fertilization higher yields have been obtained. Oats yield 30 to 50 bushels per acre; timothy and clover hay, 1 to 2 tons; rye, 15 to 30 bushels; barley, 25 to 40 bushels; tobacco, 600 to 1,000 pounds; Irish potatoes, 100 to 175 bushels; buckwheat, 10 to 15 bushels; alfalfa, 1 to 3 tons; and wheat, 10 to 20 bushels.

This soil is handled in practically the same way as the Miami silt loam. Corn is followed by small grain and this by mixed timothy and clover. Very little fertilizer is used other than barnyard manure, although very marked increases in yields of almost all crops have been obtained by the use of either acid phosphate or raw rock phosphate. With the application of ground limestone a much better stand of clover and alfalfa is obtained.

The selling price of this land ranges from $60 to $125 an acre, depending upon the improvements, transportation facilities, and distance from towns.

While the Miami fine sandy loam is easily cultivated and readily improved, there has been a marked decrease in the productiveness of many farms, owing to a neglect to rotate crops, to grow clover, and to prevent the washing away of the soil on the hillsides. The steeper slopes should be seeded to grass and used as permanent pasture or for growing alfalfa. On the more gentle slopes it would be best to practice contour cultivation, and to grow winter crops of rye or wheat after corn. The type is low in organic matter and phosphorus, and is usually in an acid condition at the surface. The organic content can be increased by supplementing the stable manure with green-manuring crops. The suggestions offered for supplying phosphorus and correcting acidity in the case of the Miami silt loam and Carrington silt loam are applicable to this type. Potatoes, beans, cucumbers, strawberries, and tomatoes do well, and their cultivation might profitably be extended where the location is favorable for marketing.

MIAMI LOAM.

The surface of the Miami loam is a light-brown loam, 8 to 11 inches deep. The subsoil is a yellowish-brown loam, grading at about 14 inches into a sandy clay loam which passes at about 16 inches into a reddish-yellow sandy clay, the latter continuing to a depth of 3 feet or more. In Newark, Avon, Spring Valley, and Magnolia Townships the Trenton or Galena limestone is often encountered within the 3-foot section. Numerous areas of Miami silt loam and fine sandy loam, too small to map, are included with the loam.

The Miami loam occurs principally in Spring Valley Township. Small areas occur in Avon, Janesville, Newark, and Magnolia Townships. The surface varies from gently rolling to rolling, and the natural drainage is good. The structure of both the soil and subsoil is favorable for the retention of moisture, and there is little serious erosion except for a few hillside gullies.

Probably 80 per cent of the type is under cultivation, the remainder being forested with oak, hickory, cherry, walnut, and maple. All the common crops do well. Corn, oats, barley, clover, and timothy are the principal crops. Corn yields from 25 to 40 bushels per acre, oats 30 to 50 bushels, barley 25 to 45 bushels, and clover and timothy from 1 to 2 tons.

The crop adaptations of this soil, its fertilizer requirements, and the general farm practices are essentially the same as in the case of the Miami fine sandy loam.

MIAMI SILT LOAM.

The Miami silt loam to a depth of 10 or 12 inches is a light-brown silt loam, often containing an appreciable amount of fine sand and gravel, and low in organic matter. Truog and litmus tests show that the soil is somewhat acid. The upper subsoil is a yellowish-brown or brownish-yellow silt loam, grading at 18 or 20 inches into a yellow silty clay loam which contains considerable fine sand and gravel. At about 24 inches a sandy clay, containing some gravel, is encountered, and this continues to a depth of 3 feet or more.

The type is subject to considerable variation, especially in the depth of the loesslike covering and in the content of sand and fine gravel. In depressions between gravel knolls and ridges and in level areas the silt loam is deeper than typical, while on ridges, knolls, and steep slopes the soil is more or less washed off, the sandy clay or till usually occurring near the surface and occasionally being exposed. In the southeast quarter of the county the silt loam layer extends to a greater depth than typical, notwithstanding the fact that the surface is rolling. West of Rock River and south of the

Late Wisconsin terminal moraine, the limestone is sometimes encountered in the 3-foot section, the lower subsoil here being residual and consisting of yellowish-red clay with small fragments of weathered limestone. There is some variation in the color, the type generally being darker near darker soils like the Carrington silt loam or the Clyde fine sandy loam or silt loam.

The Miami silt loam is one of the most extensive types in the county. It covers most of the northern part of the county and occurs in large areas in the southeastern quarter, west of Afton, and between Brodhead and Evansville. Smaller areas occur throughout the county.

The surface ranges from gently rolling to rolling, with occasional undulating areas. In the northern part of the county, in the region of the Late Wisconsin drift, the topography is largely glacial, being characterized by kames, drumlins, eskers, potholes, and moraines where streams have done little work. In the remainder of the county the surface features are due almost entirely to stream erosion.

This is a very important type, probably 80 per cent of it being under cultivation. General farming in conjunction with dairying is the principal type of agriculture. The forested areas support a growth of bur oak, white oak, black oak, red oak, maple, hickory, basswood, walnut, cherry, and elm.

Corn, hay, oats, and barley are the leading crops, ranking in acreage in the order named. Irish potatoes, wheat, rye, beans, and alfalfa are grown in a small way, and tobacco, peas, and sugar beets are special crops of importance. Tobacco is grown extensively about Edgerton and to some extent over the entire type. Near Evansville a number of farmers are engaged in growing peas for canning. Sugar beets are grown in the northern part of Rock County and are shipped largely to the factory at Janesville. There are a number of home apple orchards, but the trees are largely neglected and the fruit is usually of inferior quality.

Corn yields 25 to 45 bushels per acre; oats, 25 to 45 bushels; barley, 25 to 40 bushels; mixed timothy and clover hay, 1 to 1½ tons; wheat, 10 to 30 bushels; tobacco, 900 to 1,600 pounds; green peas for canning, about 1,800 pounds; and dry peas, about 20 bushels per acre. Where the green peas are picked for canning the vines are often used for silage. Sugar beets yield 9 to 16 tons per acre and the sugar content is higher than that of beets grown on the dark-colored soils. Stable manure is about the only fertilizer used for general-farm crops and where tobacco is grown the greater part of it is applied to the tobacco patch. The rotation most commonly followed consists of corn, a small grain for 2 years, and timothy and clover. Hay may be cut for 2 years and the field pastured for a year before being again plowed for corn.

The value of land of the Miami silt loam ranges from $100 to $200 an acre, depending upon the location and improvements.

The State Soils Laboratory of Wisconsin states that this soil is frequently in need of ground limestone, phosphorus, and nitrogen. Finely ground limestone should be applied to land intended for corn at the rate of 2,000 to 2,500 pounds an acre, and 1,000 pounds of rock phosphate per acre should be worked into the soil. Both the lime and phosphorus applications will greatly promote the growth of clover. There is no better way to maintain and increase the nitrogen content of this soil than to grow clover for feeding stock, and to return the manure to the land, supplemented by the plowing under of part of the clover crop, the second growth preferred, since the first crop is usually needed for hay. On most farms deeper plowing and more thorough cultivation would increase the productiveness. Contour plowing should be practiced on the steep slopes to prevent erosion, and many of the steep areas are best kept in permanent pasture.

Miami silt loam, deep phase.—The Miami silt loam, deep phase, to a depth of 12 to 14 inches consists of a light-brown, friable silt loam, low in organic matter. When dry the surface material has an ashen appearance. Gravel, bowlders, and fine sand are noticeably less abundant than in the typical Miami silt loam. Truog and litmus tests show that this soil is somewhat acid. The subsoil consists of a yellowish-brown silt loam which becomes heavier with depth, grading at about 24 inches into a silty clay loam which at 34 to 36 inches often shows a slight mottling of gray. Both soil and subsoil have a very smooth feel and a loesslike structure. There is a sharp line of demarcation between the loesslike material and the underlying glacial till, which contains stones, bowlders, and gravel. The gravel consists chiefly of limestone.

Where this phase borders the Carrington or Clyde soils the color at the surface may range from brown to dark brown. Where it borders the typical Miami silt loam it often contains some gravel at depths of 24 to 36 inches. Some areas of typical Miami silt loam and Clyde silt loam, too small in extent to warrant separation, are included with the phase as mapped.

With the exception of a few small areas in Porter and Fulton Townships, the Miami silt loam, deep phase, is confined to the southeastern quarter of Rock County, where it is an extensive soil. The surface ranges from gently undulating to gently rolling. Drainage is good except in the more gently undulating areas, where tile drains are needed. The soil retains moisture very well, and crops suffer less during long, dry periods than on most of the other soils of the county. The phase is not subject to destructive erosion.

This is one of the more productive soils of the county, and about 90 per cent of it is under cultivation. General farming in connection with dairying is the leading type of agriculture. The small woodlots support a growth of bur oak, black oak, red oak, maple, elm, hickory, and cherry. The same crops are grown as on the typical soil, and the farming methods are similar. Yields are slightly higher, and the selling price shows some difference, ranging from $150 to $300 an acre.

This phase is also in need of liming and responds to applications of phosphorus and nitrogen. Tiling would give good results in the gently undulating areas where the soil is backward in the spring. The acreage in alfalfa might be increased with profit, and, as on the typical soil, more thorough cultivation is needed.

UNION SILTY CLAY LOAM.

The surface soil of the Union silty clay loam is a light-brown to brown silt loam to silty clay loam, containing a small amount of organic matter. At 8 to 11 inches a reddish-brown to reddish-yellow clay is encountered, grading at 16 to 30 inches into the weathered limestone. Irregular limestone and chert fragments are often scattered over the surface, and are present in both soil and subsoil. On steep slopes the reddish-brown clay is often exposed at the surface. As mapped, this type includes many small areas of Union loam and Miami silt loam.

The Union silty clay loam is not extensive. It is developed in the western part of the county in Magnolia, Spring Valley, and Avon Townships. The surface is rolling to hilly, as the type occupies steep slopes and sharp, narrow ridges where erosion is serious, developing deep gullies and ravines.

Probably 25 per cent of the Union silty clay loam is cultivated. The remainder supports a tree growth consisting of white oak, bur oak, red oak, black oak, maple, poplar, hickory, and basswood, and is used as permanent pasture.

On the less rolling areas corn yields 35 to 45 bushels per acre, oats 30 to 45 bushels, barley 25 to 45 bushels, wheat 12 to 20 bushels, and mixed timothy and clover about 1½ tons of hay. A few good stands of alfalfa have been obtained. The methods of handling and fertilizing are essentially the same as on the Miami silt loam.

The selling price of land of the Union silty clay loam ranges from $50 to $75 an acre, depending largely upon the proportion of cleared land, the topography, the extent of erosion, and the location and improvements.

Great care must be taken in farming this soil to prevent erosion. A good practice is to plow the land in strips following the contour

of the hills, leaving strips of sod between the plowed areas. The steeper slopes should remain in permanent pasture. The supply of organic matter should be increased by supplementing the stable manure with green manuring crops, preferably legumes. Where the soil is in an acid condition finely ground limestone should be applied. The growing of alfalfa could be very profitably extended, especially where dairying is carried on.

Small areas of a loam variation are included with the Union silty clay loam as mapped. The surface soil consists of a light-brown loam, low in organic matter, underlain at 8 to 12 inches by a reddish-brown sandy clay loam or sandy clay, which grades at 16 to 24 inches into the weathered limestone. Limestone and chert fragments are often present in both soil and subsoil, and are scattered over the surface. On the steep slopes where erosion has been active there are many exposures of the reddish-brown clay. The Union loam is inextensive. It occurs in Spring Valley Township, the western part of Newark Township, and the northern part of Avon Township. The surface is rolling or steep, and the surface drainage is good. Practically the same crops are grown, and the same yields are obtained, as on the typical Union silty clay loam. The selling price of the land is about the same. The suggestions offered for the improvement of the typical Union silty clay loam are applicable also to this soil.

The following table gives the results of mechanical analyses of samples of the soil, subsoil, and lower subsoil of the Union silty clay loam:

Mechanical analyses of Union silty clay loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
312352	Soil	0.1	3.4	5.8	14.3	4.3	52.8	19.1
312353	Subsoil	.0	2.1	3.5	9.5	2.4	44.1	38.2
312354	Lower subsoil	.0	.8	1.2	8.4	40.4	34.7	15.2

BOONE FINE SANDY LOAM.

The Boone fine sandy loam to an average depth of 8 to 10 inches consist of a light-brown to brown fine sand or fine sandy loam, very low in organic matter and in an acid condition. The subsoil is a yellow fine sandy loam which becomes heavier with depth and gives way at 20 to 24 inches to a yellow sandy clay, the latter continuing to a depth of 3 feet or more. Fragments of sandstone are sometimes present in both soil and subsoil. In some places, especially near the base of slopes, the surface soil is a light-brown or brown fine sand

passing at about 10 inches into a yellow fine sand, which may continue to 24 or 30 inches before a yellow fine sandy loam is encountered. On the slopes, immediately below sandstone outcrops, irregular fragments of sandstone are scattered over the surface and disseminated throughout the soil in sufficient quantities to hinder cultivation.

The Boone fine sandy loam occurs largely on slopes below outcrops of the St. Peters sandstone in the extreme western part of the county, in Newark, Avon, Spring Valley, and Magnolia Townships. The topography is gently sloping to steep, and the drainage is always sufficient. On the steep slopes there is considerable damage by erosion, and deep gullies have developed in a number of places.

Less than half of this soil is under cultivation, the remainder being in permanent pasture. The native forest growth consists of several varieties of oak, and hickory, walnut, poplar, basswood, and white birch.

Corn, oats, hay, rye, buckwheat, and potatoes are grown in a prevailing system of general farming. Corn yields about 25 bushels per acre, oats about 30 bushels, mixed clover and timothy hay 1 ton, rye 14 to 18 bushels, buckwheat 10 to 14 bushels, and potatoes about 125 bushels per acre.

The selling value of this land ranges from $50 to $75 an acre, depending upon the topography, the percentage of land under cultivation, and the general improvements.

This type is very deficient in organic matter, is in an acid condition, and is deficient in phosphorus. The suggestions offered for the improvement of the Miami fine sandy loam and the Carrington loam are applicable also to this type.

Included with this type are a few small areas of the Boone fine sand. These occur in the southeast corner of Avon Township and the southwest corner of Newark Township. The soil consists of a brown fine sand, 8 to 10 inches deep, grading into a yellow to pale-yellow fine sand that extends to a depth of 3 feet or more. In a few places the lower subsoil material is sticky. The topography ranges from gently rolling to rolling, with dunes in places exposed to wind action. The drainage is usually excessive.

Probably 30 per cent of the type is cultivated, the remainder supporting a growth of oak, hickory, and poplar, and being used for permanent pasture. Corn yields 20 to 25 bushels per acre, oats 20 to 25 bushels, rye 14 to 16 bushels, and buckwheat 8 to 12 bushels.

CRAWFORD CLAY LOAM.

The Crawford clay loam consists of a blackish clay loam, clay, or sandy clay, passing at about 8 inches into a heavy, dark reddish brown clay, which at 11 to 13 inches grades into weathered limestone.

Angular fragments of limestone and chert are scattered over the surface and disseminated through the soil section in sufficient quantities to hinder or even preclude cultivation.

This type is confined to a few small areas along ridges and steep hillsides southwest of Orfordville. The surface drainage is usually good.

Because of its small extent and the proximity of the limestone to the surface, the type is unimportant in the agriculture of Rock County. Probably 75 per cent of it is under cultivation. Corn, oats, and hay are grown, and give fair yields.

The incorporation of vegetable matter will improve the texture of this soil and make it easier to cultivate. The steep slopes should be kept in permanent pasture, on account of washing.

The following table gives the results of mechanical analysis of a sample of the soil of the Crawford clay loam:

Mechanical analysis of Crawford clay loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
312351.....	Soil.....	0.1	2.4	5.4	20.3	6.4	35.9	29.4

FOX LOAM.

The Fox loam consists of a brown loam, passing at about 10 inches into a heavy, yellowish-brown loam or light sandy clay loam, which grades downward into a yellowish-brown or brownish-yellow gravelly sandy clay. At about 30 inches stratified beds of yellow gravel and sand are encountered. Litmus-paper tests show that the surface soil is acid. In some places the beds of gravel and sand are within 20 inches of the surface, while in others they do not occur within the 3-foot section. Southeast of Evansville the surface soil is somewhat darker than typical, and the subsoil shows more or less mottling with yellow, brown, and drab. There are some included areas, too small to map, of Fox silt loam and fine sandy loam, and Clyde loam and fine sandy loam.

The Fox loam is well distributed in small areas west of Rock River and in Turtle Township. Its largest development is southeast of Evansville.

The topography ranges from almost level to gently sloping or gently undulating, and the natural drainage is good except in the areas southeast of Evansville, where artificial drainage would be beneficial. The soil is open and porous, and readily absorbs the normal rainfall.

Almost all of the Fox loam is under cultivation, largely to corn, oats, barley, rye, and mixed clover and timothy hay. The farming methods are essentially the same as on the Fox silt loam.

The Fox loam is easy to cultivate, and a mellow seed bed can be readily obtained. In the improvement of the type it is necessary to correct its acidity, which may be done by applying ground limestone at the rate of 1,500 to 2,000 pounds per acre. Where the acidity has been corrected and the soil inoculated, alfalfa can be successfully grown and is a valuable crop. The type is deficient in organic matter, which can be supplied by adding barnyard manure or plowing under green-manuring crops. Raw rock phosphate would probably increase the productiveness of the soil. An application of 1,000 pounds per acre would not be excessive.

Small areas of a fine sandy loam variation are included with this type. The soil consists of about 10 inches of light-brown to brown fine sandy loam, underlain by pale-yellow fine sandy loam which extends to 13 or 14 inches, becoming heavier with depth. The pale yellow subsoil ranges from a heavy fine sandy loam to a sandy clay. In some places it extends to a depth of more than 3 feet, while in others a bed of stratified medium and fine sand or gravel is encountered at depths of 2 to 3 feet. The soil has a total area of less than 2 square miles, but is rather widely distributed over that part of the county west of Rock River. It occupies flat or undulating areas along streams and on glacial outwash plains, but drainage is good except in a few areas where the ground water is near the surface. Most of the land is cultivated. The original forest growth consisted of oak, maple, hickory, and basswood. The same crops are grown as on the Fox silt loam, but yields are somewhat lower than on the well-drained areas of the latter type. The soil needs more organic matter, and in places an acid condition has developed, which may be corrected by applying ground limestone at the rate of 1,200 to 1,500 pounds per acre. The soil is probably better adapted to truck crops than to general farming.

Fox loam, light-textured phase.—The Fox loam, light-textured phase, to a depth of about 10 inches, consists of a loamy brown sand, underlain by a brownish-yellow loamy sand which at about 14 inches grades into yellow sandy loam, the latter continuing to a depth of more than 36 inches. There is usually some gravel in the lower subsoil. In places the surface soil is a brown sandy loam, passing at about 10 inches into a yellow sandy clay loam which grades downward into a yellow sandy loam. In some places beds of gravel and sand are encountered within the 3-foot section.

This soil is found on the lower terraces along Rock River, on the higher terraces along Sugar River and Bass Creek, and on the out-

wash plain south of Evansville. The surface is level to gently undulating, but drainage is well established.

Probably 75 per cent of the phase is under cultivation, while the remainder supports a growth of oak, hickory, maple, and basswood. Corn, oats, rye, and hay are the chief crops. Corn yields 25 to 40 bushels per acre, oats 20 to 35 bushels, rye 15 to 25 bushels, and mixed clover and timothy about 1 ton. Buckwheat yields about 12 to 18 bushels per acre, navy beans about 10 to 13 bushels, and Irish potatoes about 100 bushels. The methods of cultivation and fertilization are essentially the same as on the Miami fine sandy loam.

This land has a value of $60 to $130 an acre, varying with the location and state of improvements.

The Fox loam, light-textured phase, is open and porous, and generally deficient in organic matter, but it is easily improved. Yields can be increased by working up a better tilth by means of heavy applications of barnyard manure, or, in the absence of this, by plowing under green-manuring crops. The practice of a systematic crop rotation, including clover to be plowed under, is especially advisable. The acidity of the soil can be corrected by applying ground limestone. Alfalfa could be successfully grown if the land were given the proper treatment. The application of phosphorus, in the form of either raw rock phosphate or acid phosphate, would probably be beneficial.

FOX SILT LOAM.

The Fox silt loam, to a depth of 10 to 12 inches, consists of a light-brown or grayish-brown, friable silt loam, which has a whitish appearance when dry owing to its very low content of organic matter. The material is almost free from sand and gravel, and has an extremely smooth feel. The upper subsoil is a brownish-yellow silt loam, grading at 16 to 20 inches into a yellow silty clay loam which may continue to a depth of 3 feet or more. In many places a silty fine sandy loam is encountered at any depth from 22 to 36 inches. It is usually underlain by stratified beds of sand or gravel.

This type occurs in comparatively large areas several miles north of Johnstown Center, west of Milton Junction, and north of Janesville along Rock River. Small areas are found in almost all parts of the county. The topography is flat to gently undulating and the drainage may be inadequate except where the underlying beds of gravel or sand are within 2 feet of the surface.

Although comparatively inextensive, the Fox silt loam is an important type. Probably 95 per cent of it is devoted to general farming, while the remainder is in woodland pasture, being forested with bur oak, elm, hickory, and ash.

Corn, oats, barley, and clover and timothy hay are the most important crops; Irish potatoes, sugar beets, and tobacco are grown rather extensively in some sections. Corn yields 25 to 50 bushels per acre, with a probable average of 35 bushels. Oats yield 35 to 55 bushels per acre, barley 30 to 45 bushels, and clover and timothy hay 1 to 1¾ tons. The same methods of cultivation, crop rotation, and fertilization are followed as on the Miami silt loam.

Land of the Fox silt loam has a selling value of $120 to $200 an acre, according to the location and state of improvements.

This type is usually deficient in organic matter, and barnyard manure or green crops should be plowed under. The poorly drained areas are in need of tile. An application of about 1,000 pounds of raw rock phosphate per acre has been found to increase the yields of corn, oats, barley, and Irish potatoes.

RODMAN GRAVELLY SANDY LOAM.

The surface soil of the Rodman gravelly sandy loam, extending to an average depth of about 10 inches, is a brown gravelly sand to sandy loam, passing into a brownish-yellow gravelly sandy loam which at about 15 inches becomes more yellowish. Beds of gravel and sand are commonly encountered in the 3-foot section.

This type occurs in Janesville Township, on the steep terrace escarpment along the east side of Rock River. The drainage is excessive, and the type is not under cultivation, being suitable only for pasture.

PLAINFIELD FINE SAND.

The Plainfield fine sand consists of 8 or 10 inches of light-brown fine sand, low in organic matter, underlain by a subsoil of mellow fine sand which extends to a depth of 3 feet or more.

Only a few, small, isolated areas of this type occur in Rock County, principally in Spring Valley, Avon, and Milton Townships. The surface is flat to gently undulating, but the drainage is usually good.

Because of its limited extent this type is unimportant agriculturally. Probably 50 per cent of it is used in growing the general-farm crops. Corn ordinarily yields about 20 to 25 bushels, oats 20 bushels, and rye 15 bushels per acre.

This soil is very deficient in organic matter, and stable manure and green-manuring crops should be plowed under. Ground limestone would be effective in correcting the acidity, and where it is used clover may be grown. When a good stand of clover is obtained it increases the productiveness of the soil for succeeding crops.

A few small included areas occupying undulating terrace positions along Sugar River south of Brodhead, and 1 mile south of Afton,

have a coarser texture than the typical Plainfield fine sand. The soil consists of a light-brown to brown sand, underlain by a brownish-yellow sand that extends to a depth of 3 feet or more. Occasionally beds of gravel and sand are encountered in the lower part of the 3-foot section. Probably 40 per cent of the area of this soil is under cultivation. Corn yields about 20 to 30 bushels, rye 12 to 20 bushels, buckwheat 10 to 15 bushels, and hay 1 ton per acre. Irish potatoes do fairly well and truck crops give fair returns when properly cared for. The soil is droughty and of low fertility.

WAUKESHA GRAVELLY SANDY LOAM.

The surface soil of the Waukesha gravelly sandy loam is a dark-brown to almost black gravelly sandy loam, 8 to 12 inches deep. The subsoil is a brownish gravelly sandy loam, passing into a brownish-yellow gravelly sandy loam at about 16 inches. At 20 to 30 inches beds of stratified sand and gravel are encountered. As mapped, the type includes some small areas of gravelly loam.

The Waukesha gravelly sandy loam occupies steep valley slopes along Turtle Creek, Rock River, and numerous tributaries which have cut their way back into the areas of valley fill. The drainage is excessive and the type has no agricultural use except as permanent pasture for stock.

WAUKESHA SAND.

The Waukesha sand consists of a dark-brown loamy sand, 12 to 16 inches deep, grading into a yellowish-brown loamy sand which is underlain at about 24 inches by a brownish-yellow, rather incoherent sand. At 30 to 36 inches a loose gravelly sand is encountered.

The soil occurs principally on the terraces of Sugar River, northwest of Avon. A small area is found in the region of valley fill on the west side of Rock River about 1½ miles south of Afton. The surface ranges from undulating to gently sloping, and the drainage is excessive.

Probably 75 per cent of the type is in cultivation, devoted to general farming. Corn yields 20 to 35 bushels, oats 25 to 40 bushels, and rye 15 to 25 bushels per acre. The selling price of the land ranges from $40 to $90 an acre.

The practice of growing corn and small grains uninterruptedly soon exhausts the organic content of this soil, and it is necessary to make heavy applications of stable manure or to grow green-manuring crops, such as clover, to be plowed under. An acreage application of 2,000 to 2,500 pounds of ground limestone will be found very beneficial in obtaining a stand of clover or alfalfa. The suggestions offered for the improvement of the Waukesha loam are applicable also to this type.

A small area north of Avon, mapped with this type on account of its small extent, might have been shown as Carrington sand. It occurs at the base of a slope below outcrops of sandstone.

The soil is a dark-brown to black sand, passing at about 10 inches into a dingy-brown sand which grades into a yellowish-brown or brownish-yellow sand at about 20 inches. This yellowish sand continues to a depth of 3 feet without important change. In all other respects this soil resembles the typical Waukesha sand.

WAUKESHA SANDY LOAM.

The Waukesha sandy loam to an average depth of about 11 to 13 inches consists of a dark-brown to almost black sandy loam which is comparatively high in organic matter. The subsoil is a brown sandy loam underlain at about 16 to 20 inches by a brownish-yellow sandy clay loam. This becomes lighter in texture with increasing depth until a yellowish sandy loam is encountered at about 28 inches, grading quickly into a gravelly loamy sand, and at about 36 inches into stratified beds of gravel and sand. Litmus-paper tests indicate that the surface soil is acid.

As mapped, this type is somewhat variable. The surface soil of included areas ranges from sand to loam. The stratified beds of gravel and sand are within 18 inches of the surface in some places, while in others they are not encountered in the 3-foot section.

The Waukesha sandy loam is of small extent. It occurs as valley-fill material in Beloit and Rock Townships along Rock River and as a higher terrace of the Sugar River in Spring Valley Township. The surface is level or gently undulating, but the drainage is good to excessive.

Practically all of the Waukesha sandy loam is devoted to general farm crops in conjunction with dairying. Corn yields 30 to 40 bushels per acre, oats 30 to 45 bushels, barley 30 to 40 bushels, rye 15 to 25 bushels, buckwheat 12 to 18 bushels, and Irish potatoes about 125 bushels. The rotations followed are practically the same as on the Waukesha loam, and the methods of improvement needed on that type are applicable also to this soil.

WAUKESHA LOAM.

The soil of the Waukesha loam consists of a dark-brown to black loam, high in organic matter, underlain at 10 to 12 inches by a dark-brown sandy clay loam which takes on a dingy-brown color at about 18 inches and passes at 30 inches into a bed of gravelly sand which continues to a depth of 3 feet or more.

As mapped this type is somewhat variable. The surface soil of included areas range from almost a sandy loam to a silt loam. The

subsoil may be a sandy loam, passing into beds of sand or gravel at 12 to 15 inches, or it may be a dark-brown loam or heavy sandy loam to a depth of 3 feet or more. In La Prairie and Rock Townships much of the type is heavier approaching a silt loam, and patches of Waukesha silt loam are included. In places these inclusions are so numerous that it is difficult to determine whether the loam or silt loam is the predominating type.

The Waukesha loam is most extensively developed in La Prairie and Rock Townships and east of Leyden in the region of valley fill along Rock River. Smaller areas occur south and southeast of Evansville, in the valley-fill region along Turtle Creek, and on the higher terrace along Sugar River.

The topography is flat to gently undulating except along terrace escarpments, where, in zones ranging from 100 to 400 feet wide, the surface is steep and broken. Drainage is well established, and is often excessive, owing to the open, porous character of the soil and the underlying beds of sand and gravel.

Next to the Waukesha silt loam, this is the most extensive of the valley-fill and terrace types. Almost all of it is under cultivation, devoted to general farming in conjunction with dairying. Corn, the principal crop, yields 30 to 45 bushels per acre. Oats, the second most important crop, yields 30 to 45 bushels per acre. Barley, rye, Irish potatoes, buckwheat, hay, sugar beets, and tobacco are successfully grown.

The necessity of changing crops from year to year is recognized, although in the majority of cases systematic crop rotations are not carried out. Corn is often grown for two years in succession, and followed by grain and hay crops. Farmers plan to seed the land to grass at least once every four or five years.

Land of the Waukesha loam has a selling value of $100 to $150 an acre, depending on the location and improvements.

Examinations made by the State soils laboratory show that this soil is in an acid condition, and is low in both phosphorus and nitrogen. Clover can not be expected to do well unless finely pulverized limestone is added, at the rate of 2 to 2½ tons per acre. This material should be applied after the land is plowed, and thoroughly worked into the soil. The nitrogen content can be replenished by applying barnyard manure, which will assist in the growing of clover and by plowing clover under once in three years the nitrogen and organic content can be maintained. Where the soil is in a depleted and sour condition it would be well to seed with a mixture composed of 3 quarts of timothy, 3 quarts of medium red clover, and 1 quart of alsike, as this combination does much better on an acid soil than medium clover alone. After the soil is thoroughly limed, red clover with some timothy should be grown instead of the alsike.

The low phosphorus content can be remedied by first using 400 to 500 pounds per acre of acid phosphate for corn and about 200 pounds for small grain, the acid phosphate preferably to be applied broadcast after the land is plowed, especially after the soil has first been treated with lime. After about two years' treatment with acid phosphate, rock phosphate may be used instead. It should be either mixed with the manure and applied at the rate of about 1,000 pounds per acre, or plowed under with green clover.

Waukesha loam, sandy phase.—The surface soil of the Waukesha loam, sandy phase, consists of a dark-brown to almost black fine sandy loam, comparatively high in organic matter, and very acid according to litmus tests. It is underlain at about 12 inches by a dingy-brown fine sandy loam which grades downward into a brownish-yellow sandy clay loam. At 24 to 30 inches stratified beds of gravel and sand are encountered.

This phase is inextensive, being confined to the valley-fill area northeast of Beloit and a small area west of that place. The surface is gently undulating, but the drainage is usually excessive. About the same crops are grown, and similar yields are obtained, as on the Waukesha sandy loam. The methods of improvement are similar to those suggested for the typical Waukesha loam.

WAUKESHA SILT LOAM.

The Waukesha silt loam, to a depth of about 12 inches, consists of a dark-brown to almost black, friable silt loam, which contains a comparatively high percentage of organic matter and some sand. The upper subsoil is a dark-brown silt loam, grading downward into a brownish-yellow silt loam or silty clay loam which contains some sand. At 24 to 36 inches a yellow fine sandy loam or sandy loam is encountered, quickly passing into a gravelly sandy loam and below this into stratified beds of gravel and sand. The type as mapped includes patches of Waukesha loam not sufficiently extensive to warrant separation.

The Waukesha silt loam is an extensive soil in the region of old valley fill east of Rock River, between Janesville and Shopiere and northeast of Beloit. Other important developments are found in the vicinity of Leyden, Evansville, and Magnolia. The topography varies from level to gently undulating, but the drainage is good.

Almost all of the Waukesha silt loam is under cultivation, general farming in conjunction with dairying being the leading type of agriculture.

Practically the same crops are grown as on the Waukesha silt loam, deep phase, but the yields are somewhat lower.

The selling price of this land ranges from $100 to $175 an acre, depending upon the location and improvements.

The means of improvement suggested for the Waukesha loam are applicable also to this soil.

Waukesha silt loam, deep phase.—The soil of the Waukesha silt loam, deep phase, consists of a dark-brown to almost black, smooth silt loam, 12 to 16 inches deep, comparatively high in organic matter and markedly acid as shown by the Truog and litmus tests. The upper subsoil is a brown silt loam, grading into a yellowish-brown silt loam which often continues to a depth of 3 feet and more, but in some places gives way to a yellowish-brown silty clay loam at about 30 inches. The latter usually contains small red accretions about the size of mustard seed. Both soil and subsoil are free from sand, gravel, and bowlders, but beds of gravel and sand occur at depths ranging from 5 to 12 feet, as may be seen on the sides of gullies.

The Waukesha silt loam, deep phase, is developed in a very large uniform area, 4 to 8 miles wide, extending from Janesville into Walworth County and representing part of the valley fill of the old Rock River Valley. Another area of about 5 square miles, forming part of the same valley fill, occurs south and east of Turtle Creek in Turtle Township. The type is also developed in the outwash plain that extends east and west across the southern portion of Milton Township, and smaller areas are distributed throughout all parts of the county.

The surface is flat or very gently undulating, and the natural drainage is somewhat deficient in many places, although it is usually fairly adequate.

This is the most extensive and the most important of the terrace soils of Rock County. Practically all of it is under cultivation, devoted largely to general farming in conjunction with dairying. The growing of sugar beets, tobacco, or cabbage is an important industry in some localities.

Corn, oats, barley, and hay are the principal crops grown, corn occupying the largest acreage. Corn yields 40 to 70 bushels per acre; oats, 40 to 65 bushels; barley, 35 to 50 bushels; mixed timothy and clover hay, 1½ to 2 tons; tobacco, 1,000 to 1,600 pounds; and Irish potatoes, 125 to 200 bushels. Sugar beets yield 13 to 18 tons per acre, but the sugar content is a little below the average for beets grown on the Miami silt loam. Cabbage yields 12 to 14 tons per acre. Comparatively few farmers follow a carefully worked-out crop rotation, although they realize that where corn is followed by a small grain, the land seeded to clover and timothy, and this sod well manured before being plowed for corn, there is a marked improvement in yields. Tobacco is often grown on the same field for at least 2 or 3 years, and it is usually followed by corn or potatoes. Owing

to the heavy applications of manure used in growing tobacco, especially good yields of the succeeding crops are obtained.

This land ranges in selling value from $125 to $300 an acre, depending upon the improvements and location. The average price is about $175 an acre.

Reports of the State Soils Laboratory of Wisconsin show that most of the Waukesha silt loam, deep phase, is in an acid condition and also in need of phosphorus. An acreage application of 1½ to 2 tons of finely pulverized limestone is needed to correct the acidity, and 200 to 300 pounds of acid phosphate or 1,000 pounds of rock phosphate per acre should be applied. Improvement in the subdrainage would permit field work to be undertaken somewhat earlier in the spring. It is probable that tile drains could be profitably installed over the greater part of the type, although their use is not essential to the profitable production of crops.

This soil has been called a deep phase of the Waukesha silt loam in order to conform to the classification used in other areas in Wisconsin. It is, however, the typical Waukesha silt loam according to the present system of classification used by the Bureau of Soils.

CLYDE FINE SANDY LOAM.

The soil of the Clyde fine sandy loam is a black or dark-brown fine sandy loam about 10 to 12 inches deep, containing considerable organic matter. In places there is a 2 to 8 inch layer of peaty material at the surface. The subsoil is a dark-drab fine sandy loam which becomes lighter in color with depth. At 20 inches a drab or gray fine sandy loam is encountered, passing into a sandy clay loam at about 30 inches. The subsoil is variable. In some places it consists of fine sand to a depth of 3 feet or more, while in others a sandy clay is encountered at about 18 inches, continuing to a depth of 3 feet or more. In all cases yellow mottlings are common throughout the subsoil.

This type is most extensive in the southern parts of Avon and Newark Townships, and in the flood plains of Taylor, Raccoon, Bass, Marsh, and North Creeks. There are small areas in the flood plains of Rock River and Turtle Creek at Beloit. The surface is low and flat, and on account of the flood-plain position and the proximity of the water table to the surface the natural drainage is poor.

Probably not more than 5 per cent of this type is in cultivation, the remainder being used for the cutting of marsh hay and as range for cattle. The native vegetation in the marshy areas consists of grasses and sedges, but in the timbered areas there is a growth of swamp oak, willow, elm, ash, maple, sycamore, quaking aspen, sumac, and alder.

Where open ditches have been constructed and the land drained acreage yields of 20 to 30 bushels of corn, 25 bushels of oats, 15 bushels of buckwheat, and about 1½ tons of timothy and clover hay have been obtained.

The selling value of this land can not readily be determined, as it is sold only with larger areas of other soils.

When properly drained the Clyde fine sandy loam is easily worked into good tilth. The great need of the type is better drainage, which would make it well adapted to corn, timothy, alsike clover, and small grains. It is not capable of producing small grain of as good quality as that grown on the Miami soils, but profitable crops can be obtained. The soil appears to be relatively low in phosphorus.

A coarser variation of this type, having the texture of a sandy loam, is recognized. The soil to a depth of 10 or 12 inches consists of a dark-brown or black sandy loam, very high in organic matter. The upper subsoil is a dark drabbish-gray sandy loam, passing at about 20 inches into a drabbish-gray, slightly gravelly sand, which continues to a depth of 3 feet or more. The principal occurrence of this soil is in the flood plain of Sugar River, in the southwest corner of the county. Small areas are found along Taylor Creek and its tributary near Brodhead. The type is flat and poorly drained, and very little of it is under cultivation, its chief use being for hay and pasture. In a few places where ditching has been done corn yields 20 to 30 bushels and oats about 25 bushels per acre.

CLYDE SILT LOAM.

The Clyde silt loam consists of 12 to 14 inches of dark-brown to black silt loam, very high in organic matter. The subsoil is a dark-gray silt loam, mottled with drab and yellow, passing at about 24 inches into a mottled brownish-yellow, yellow, and drab silty clay loam which may continue to a depth of 3 feet or more.

The type as mapped is not uniform. The surficial 1 to 8 inches in many cases consists of peaty material. In flood plains a zone of peaty material, ranging from 1 to 10 inches, may be encountered in either the upper or lower subsoil. Occasionally along streams the black silt loam has been deposited over loam and fine sandy loam, while in other instances the surface material to a depth ranging from 1 to 10 inches is a light-brown silt loam, underlain by black silt loam or peaty silt loam.

The Clyde silt loam is an extensive soil in Rock County. It occurs principally in the southeast corner of the county, but many areas, ranging from a few acres to several hundred acres, are found in the flood plains of streams and in shallow basins in all sections.

The surface is flat or basinlike, since the type is confined to low, poorly drained bottom areas and kettle basins, ponded valleys, and old sloughs.

The Clyde silt loam is an extensive and important type, although probably 80 per cent of it is used for hay production and pasture, being partly covered with a growth of elm, ash, bur oak, soft maple, willow, sumac, and sycamore.

This is the strongest soil of the county. It is especially adapted to corn. Grasses make a very rank growth. Small grains can be produced with profit, but they are likely to lodge and the quality of the grain is not equal to that produced on the light-colored silt loam soils of the county. Alsike clover, timothy, sugar beets, and cabbage do well. Peas are grown to some extent, but run too much to vine to give best results.

Corn on this soil yields 35 to 45 bushels per acre, oats and barley 24 to 40 bushels, and timothy 1½ to 2 tons. Sugar beets yield 12 to 18 tons per acre, but the sugar content is lower than that of beets grown on the lighter-colored upland soils.

The most common system of cropping consists of growing hay for 1 or 2 years, after which corn is grown for 2 years, a small grain crop being then usually sown, after which the field is again seeded to timothy or timothy and alsike.

The selling price of improved land of the Clyde silt loam ranges from $150 to $300 an acre, while unimproved areas range from $75 to $150, depending upon the location and drainage possibilities.

The Clyde silt loam is naturally a very strong, productive soil. Its great need is drainage. Conservative estimates place the cost of tiling at $25 to $35 an acre, and although open ditches are effective, tile drains are preferable.

A loam variation of this type is recognized, but on account of its small acreage, it is not indicated on the map. It consists of 12 to 14 inches of black loam, high in organic matter, underlain by a dark-gray, gritty silt loam mottled with yellow. At about 20 inches a yellowish-brown, friable clay loam or heavy loam, with yellow mottlings, is encountered. This grades at about 30 inches into a mottled yellow and drab fine sandy loam or sandy loam, which is underlain by stratified beds of gravel and sand. In some places the surficial few inches consists of peaty material. This variation is confined to the flood plains of Otter Creek, in the northeastern part of Rock County, and of Marsh, Bass, Taylor, North, and Raccoon Creeks, lying west of Rock River. The soil is level and poorly drained, and it is necessary to lay tile drains or dig open ditches before profitable yields can be obtained. Only a small acreage of this soil is under cultivation, but where drainage has been established good crops are produced. The open marsh areas are used largely

as hay and pasture land, while the woodland serves as permanent pasture. The tree growth consists of willow, bur oak, water maple, elm, ash, sumac, alder, and sycamore. Where the soil has been reclaimed by drainage corn yields 35 to 70 bushels per acre. The same treatment is required for this soil as for the typical Clyde silt loam.

PEAT.

Peat, as mapped in Rock County, consists of vegetable matter in various stages of decomposition, mingled with varying proportions of mineral matter. It typically consists of black or dark-brown, fibrous to rather finely divided vegetable matter, mixed with a small amount of fine sand and silt. The depth ranges from 1½ to 20 feet, averaging about 4 feet. The greater part of the Peat is quite fibrous, but in a number of places it is fairly well decomposed and tenacious, so that it can be molded with the hands. When dry this well-decomposed Peat somewhat resembles a black, carbonaceous clay. In areas of sandy soils Peat is frequently underlain by sandy material, while in regions of heavy upland soils the underlying material is clayey in character. Most of the areas of Peat are underlain by material as heavy as a loam, or heavier. The largest areas underlain by sand occur along Raccoon Creek in Newark Township. Probably 95 per cent of the remaining areas are underlain by heavy material.

Peat occurs most extensively in the marshes of Lima and Milton Townships, along Allen Creek south of Evansville, along Bass Creek between Footville and Afton, and on Raccoon Creek. Smaller areas are scattered west of the Rock River.

The surface is low, level, and very poorly drained. During early spring some of the marshes are entirely covered with water, but later in the summer many areas of Peat are sufficiently dry and firm to bear the weight of farm animals, so that they can be pastured or cut for hay where there is a growth of wild grasses. In the areas covered by the Late Wisconsin moraine the Peat beds largely occupy old lake basins, ponded valleys, kettle basins, glacial sloughs, and other depressions in the uneven surface developed by the glacial ice sheet, and small bodies are also developed in the flood plains of streams. In the remainder of the county, all of which is covered more or less by pre-Wisconsin drift, the Peat beds are confined wholly to stream flood plains.

Peat has been formed through the growth and partial decomposition in the presence of water of a rank vegetation, the black or dark-colored material being formed largely from grasses and sedges, and that having a brown color chiefly from sphagnum moss. About the margins of the larger marshes and over the greater part of the smaller ones varying quantities of mineral soil from the adjoining higher land have been washed in and incorporated with the vegetable

matter. Although the greater part of the Peat occurs within the region where the upland soils are made up in part of limestone material, some of it is in an acid condition. This is usually the case in the center of the larger marshes, while many of the smaller ones are not thus affected.

The native growth in the Peat areas consists of several varieties of grasses and sedges, arrowhead, cat-tail, various reeds and rushes, and sphagnum moss.

Only a very small percentage of the Peat of Rock County has been ditched and reclaimed. Where thoroughly drained and properly handled it produces good yields of corn, mixed timothy and alsike, oats, potatoes, onions, celery, and cabbage. The potatoes are not of as good quality as those grown on sandy soils, and small grain is likely to lodge and be of somewhat lower grade than where grown on upland soil.

The Peat is very rich in nitrogen, and the best practice is to use commercial fertilizers in preference to stable manure, which can be used to better advantage on the upland soils. Peat runs very low in both phosphorus and potash. The former can be supplied by applying 1,000 pounds of finely pulverized rock phosphate per acre, followed by 400 to 600 pounds each 3 or 4 years thereafter. For sugar beets and cabbage from 250 to 300 pounds of either muriate or sulphate of potash should be applied per acre, for corn and potatoes about 150 pounds, and for cereals and hay grasses 100 pounds. Dry, unleached wood-ashes contain 3 to 5 per cent of potassium, so that an application of a half ton per acre would be equivalent to 100 pounds of high-grade sulphate or muriate.

Peat, shallow phase.—The shallow phase of Peat consists of 10 to 18 inches of black or dark-brown vegetable matter in varying stages of decomposition, mixed with more or less sand, silt, or clay. This phase is developed in small areas in the southeastern and northeastern townships of the county, and along Waukoma, Allen, Marsh, Bass, Raccoon, Norwegian, and Taylor Creeks, and Sugar River.

In topography, drainage, and character of vegetation this phase is similar to the typical Peat. The same methods of improvement and the present fertilizer requirements are also essentially the same.

Some of the marshes are underlain with clay, clay loam, or silt loam at a depth of only 12 to 15 inches. When these are first drained there is often a marked need of potash fertilizer or barnyard manure for a few years, but later this need partially or entirely disappears. This seems to be due to the settling of the mucky layer upon being drained and worked, permitting the underlying material, which contains a good supply of potassium, to become mixed with the organic material so as to supply plants with potash.

SUMMARY.

Rock County is situated in the extreme southern part of Wisconsin. It has an area of 716 square miles, or 458,240 acres.

The county lies entirely within the drainage system of Rock River. The topography ranges from level or gently undulating in the prairie and filled valley sections to hilly and broken in the rougher parts of the county.

Rock County was established in 1836. Settlement began in 1835. The population in 1910 was 55,538, of which 43.2 per cent was rural.

The entire county is well provided with both railroads and public highways. All sections are well settled.

The climatic conditions are favorable for general farming and dairying. The mean annual temperature is reported at Beloit as 47.4° F., and the mean annual precipitation as 32.71 inches. There is normal growing season of 181 days.

The agriculture of Rock County consists of general farming in conjunction with dairying. The principal crops are corn, oats, barley, clover, timothy, alfalfa, rye, buckwheat, wheat, and emmer. A number of special crops are grown, including tobacco, potatoes, sugar beets, peas, and cabbage. Hog raising is developed rather extensively, and some beef cattle are fed.

Land values range from $40 an acre on the sandy and more broken areas to $300 in the most highly improved sections.

The soils of Rock County are derived from glacial drift, from the underlying rock formations, and from water-laid materials. Eleven soil series including 25 types in addition to Peat, are recognized.

The Miami series, which is the second in extent in the county, consists of light-colored, originally timbered glacial soils carrying considerable limestone material. The silt loam occurs in large areas and is well adapted to all the farm crops common to the region. It is among the best soils in the county for peas. The loam and fine sandy loam, while not equal to the silt loam, give good results in general farming. The latter is well suited to truck crops.

The Bellefontaine series is quite similar to the Miami series, the principal difference being in the more thorough drainage and aeration. The four types in the series occupy 13 per cent of the area of the county. The silt loam is the most extensive of the types. It is adapted to the same crops as the Miami silt loam, and gives somewhat larger yields. The gravelly loam is used largely for pasture, not over 20 per cent being under cultivation. The loam and sandy loam are good soils of small extent, nearly all in cultivation.

The Carrington series comprises dark-colored, upland prairie soils derived from glaciated limestone material. The silt loam is extensively developed and constitutes one of the best agricultural soils

in the State. The loam and fine sandy loam are good general-farming soils. The gravelly sandy loam is mainly in pasture.

The Union series is comprised of light-colored, forested upland soils derived from limestone. Probably 25 per cent of the area of the silty clay loam is cultivated, and this soil is well suited to general-farm crops where the surface is not so sloping that wash and gullying interfere.

The Crawford clay loam is a dark-colored, upland prairie soil derived from limestone. It is an inextensive soil used for general farming. Fair yields are obtained.

The Boone fine sandy loam is a light-colored forested soil derived from the weathering of sandstone, in this county chiefly the St. Peters sandstone. It is of rather low agricultural value.

The Clyde series consists of dark-colored soils within the glaciated limestone region, originating through the influence of poor drainage and the accumulation of organic matter acting on the original glacial till of the basins or on accumulations of water-laid material washed into and deposited on the floors of the basins. The silt loam, which is extensively developed in Rock County, is one of the best corn soils of the State when properly drained. Small areas of the fine sandy loam also are farmed. The Clyde soils give moderate yields of corn and oats.

The Fox loam and silt loam are light-colored forested soils occurring mainly in glaciated limestone regions and occupying outwash plains or stream terraces. They are well adapted to the general-farm crops.

The Waukesha series comprises dark-colored, prairie soils derived from reworked glacial material, and deposited as outwash plains or terraces. The silt loam is an extensive soil constituting some of the best agricultural land in Rock County. Tobacco and sugar beets do very well on this soil. The loam, sandy loam, and sand, ranking in importance in the order named, are used for general farm crops and to some extent for truck crops. The gravelly sandy loam has a steep surface and should remain in pasture.

Peat consists of vegetable matter in various stages of decomposition, mingled with varying proportions of mineral matter. The drained and reclaimed Peat makes good farm land.

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[PUBLIC RESOLUTION—No. 9.]

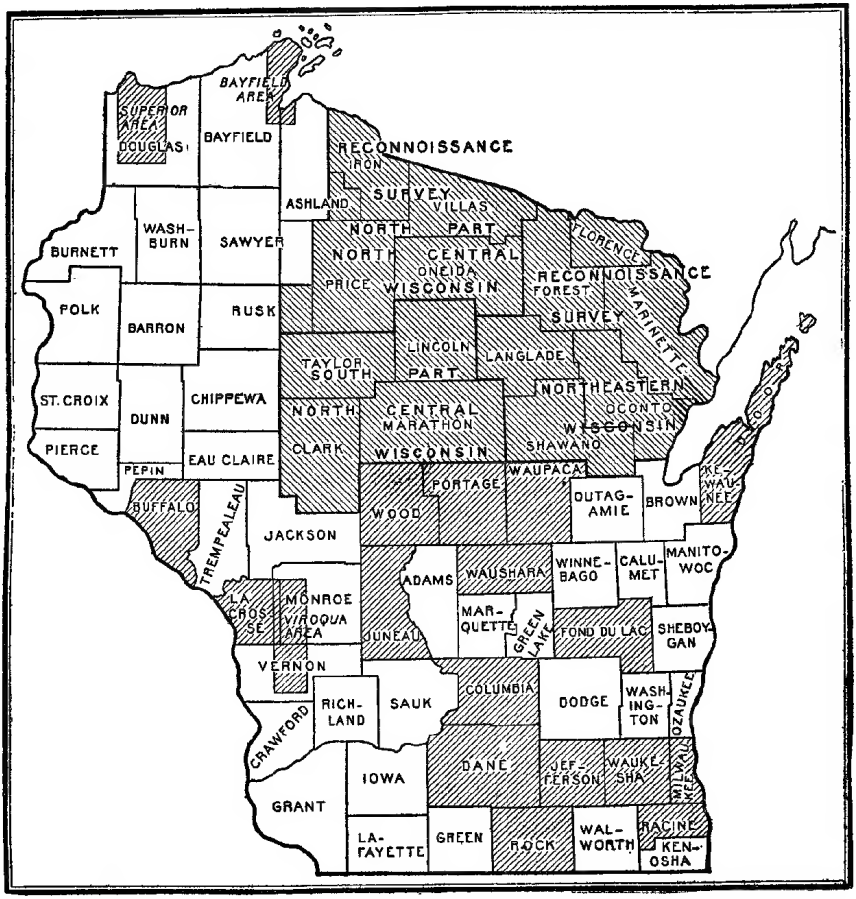
JOINT RESOLUTION Amending public resolution numbered eight; Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, "providing for the printing annually of the report on field operations of the Division of Soils, Department of Agriculture."

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, be amended by striking out all after the resolving clause and inserting in lieu thereof the following:

That there shall be printed ten thousand five hundred copies of the report on field operations of the Division of Soils, Department of Agriculture, of which one thousand five hundred copies shall be for the use of the Senate, three thousand copies for the use of the House of Representatives, and six thousand copies for the use of the Department of Agriculture: *Provided*, That in addition to the number of copies above provided for there shall be printed, as soon as the manuscript can be prepared, with the necessary maps and illustrations to accompany it, a report on each area surveyed, in the form of advance sheets, bound in paper covers, of which five hundred copies shall be for the use of each Senator from the State, two thousand copies for the use of each Representative for the congressional district or districts in which the survey is made, and one thousand copies for the use of the Department of Agriculture.

Approved, March 14, 1904.

[On July 1, 1901, the Division of Soils was reorganized as the Bureau of Soils.]



Areas Surveyed in Wisconsin.

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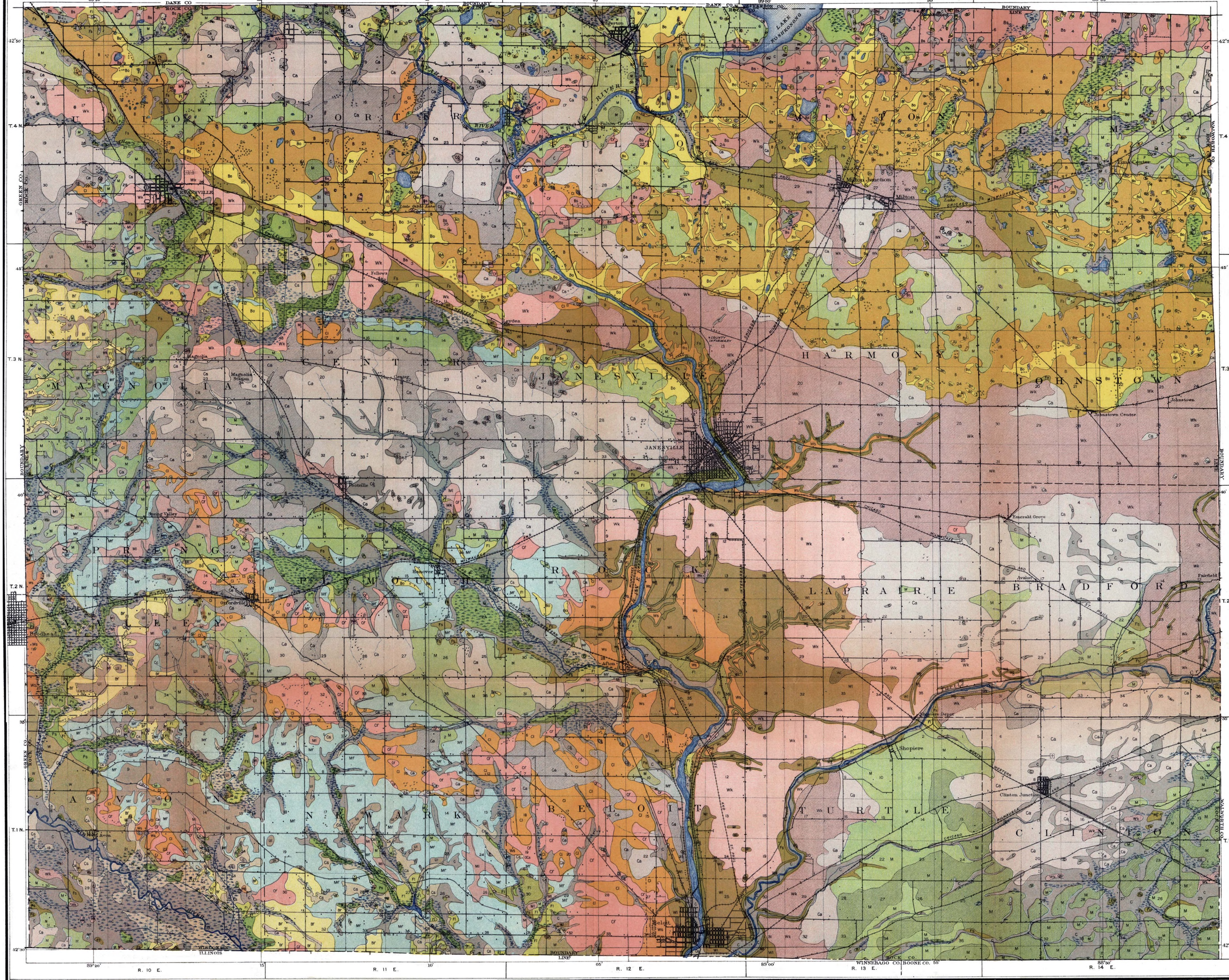
U.S. DEPT. OF AGRICULTURE
BUREAU OF SOILS
MILTON WHITNEY, CHIEF
CURTIS F. MARBUT, IN CHARGE SOIL SURVEY

SOIL MAP
WISCONSIN
ROCK COUNTY SHEET

STATE OF WISCONSIN
GEOLOGICAL AND NATURAL HISTORY SURVEY
H. ULLSVIK, DIRECTOR
COLLEGE OF AGRICULTURE, UNIVERSITY OF WISCONSIN
E.A. ROSSELL, DEAN
A.R. WHITSON, IN CHARGE SOIL SURVEY



LEGEND

- Bellefontaine gravelly loam — Bo
- Miami fine sandy loam — Mf
- Bellefontaine fine sandy loam — Bs
- Miami loam — Ml
- Bellefontaine loam — Bl
- Miami silt loam — M
- Bellefontaine silt loam — B
- M, Deep phase
- Boone fine sandy loam — Bf
- Plainfield fine sand — Ps
- Carrington gravelly sandy loam — Cg
- Rodman gravelly sandy loam — Rs
- Carrington fine sandy loam — Cf
- Union silty clay loam — Ul
- Carrington loam — Cl
- Waukesha gravelly sandy loam — Wg
- Carrington silt loam — Ca
- Waukesha sand — W
- Ca, Shallow phase
- Waukesha sandy loam — Ws
- Clyde fine sandy loam — Cs
- Waukesha loam — Wl
- Clyde silt loam — C
- Wl, Sandy phase
- Crawford clay loam — Cc
- Waukesha silt loam — Wk
- Fox loam — Fl
- Wk, Deep phase
- Fl, Light-textured phase
- Peat — P
- Fox silt loam — Fs
- P, Shallow phase

CONVENTIONAL SIGNS

CULTURE
(Printed in black)

- City or Village, Roads, Buildings, Wharves, Jetties, Breakwater, Levee, Lighthouse, Fort.
- Secondary roads and Trails
- Railroads, Steam and Electric
- Bridges, Ferry
- R.R. crossings, Tunnel
- Ford, Dam
- School or Church, Creameries, Cemeteries
- Mine or Quarry, Mine dumps, Made land
- Bluff, Escarpment, Rock outcrop and Triangulation station
- Stony and Gravelly areas
- Soil boundaries
- Boundary lines
- Boundary lines
- Boundary lines
- U.S. township and section lines

RELIEF
(Printed in brown or black)

- Contours, Depression contours
- Prominent Hills, Mountain Peaks
- Sand, Wash, and Sand dunes
- Shore and Low-water line, Sandbar

DRAINAGE
(Printed in blue)

- Streams
- Lakes, Ponds, Intermittent lakes
- Intermittent streams
- Springs, Canals and Ditches, Flumes
- Swamp, Salt marshes
- Submerged marsh, Tidal flats

The above signs are in current use on the soil maps. Variations from the usage appear in some maps of earlier date.

Thomas D. Rice, Inspector, Northern Division.
Soils surveyed by W.J. Geib, in charge, and Arthur E. Taylor, of the U.S. Department of Agriculture, and Guy Conrey, and W.M. Gibbs, of the Wisconsin Geological and Natural History Survey.

BASE MAP FROM
U.S. GEOLOGICAL SURVEY SHEETS

Scale 1:62500
1 0 1 2 3 4 Miles

SNYDER & BLAKELY, N.Y.

Field Operations
Bureau of Soils
1917